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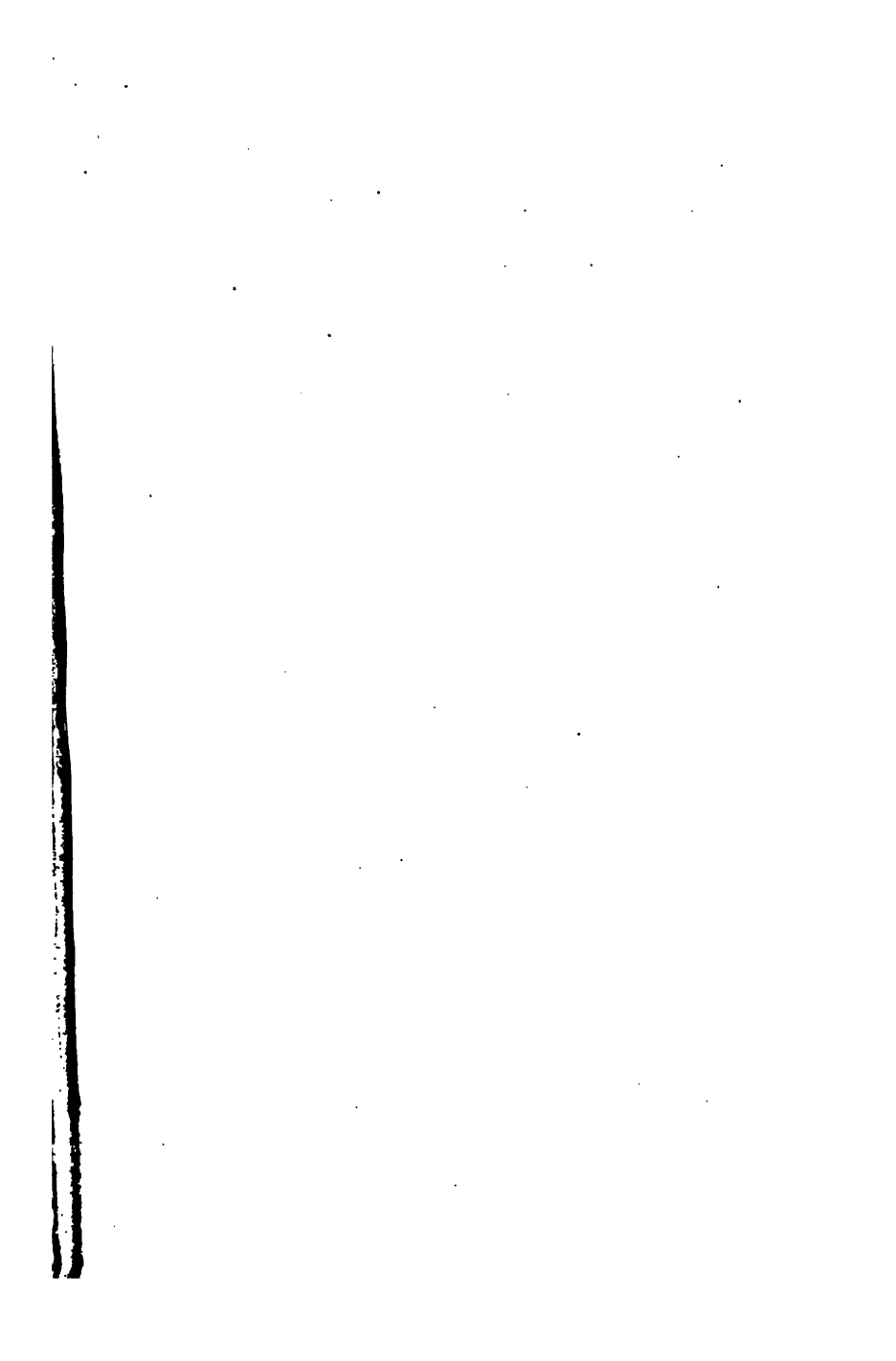
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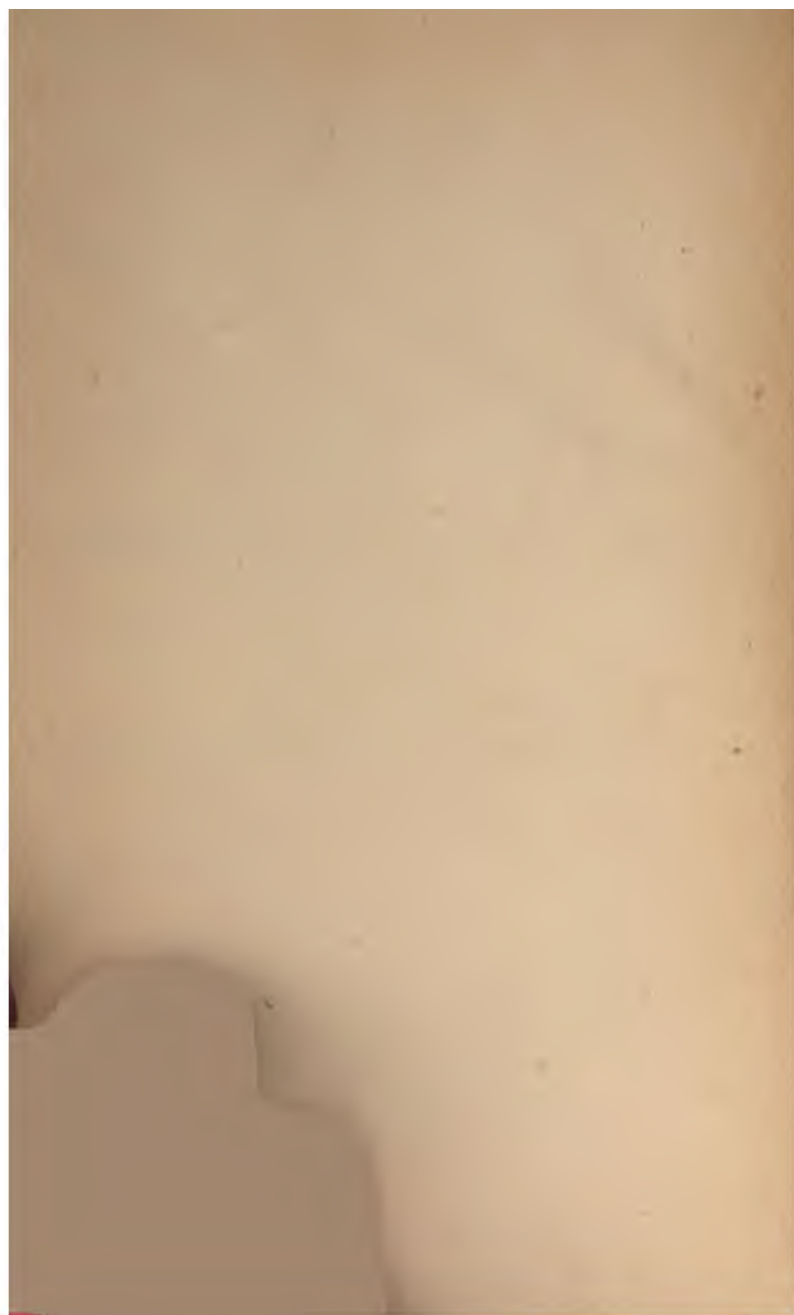
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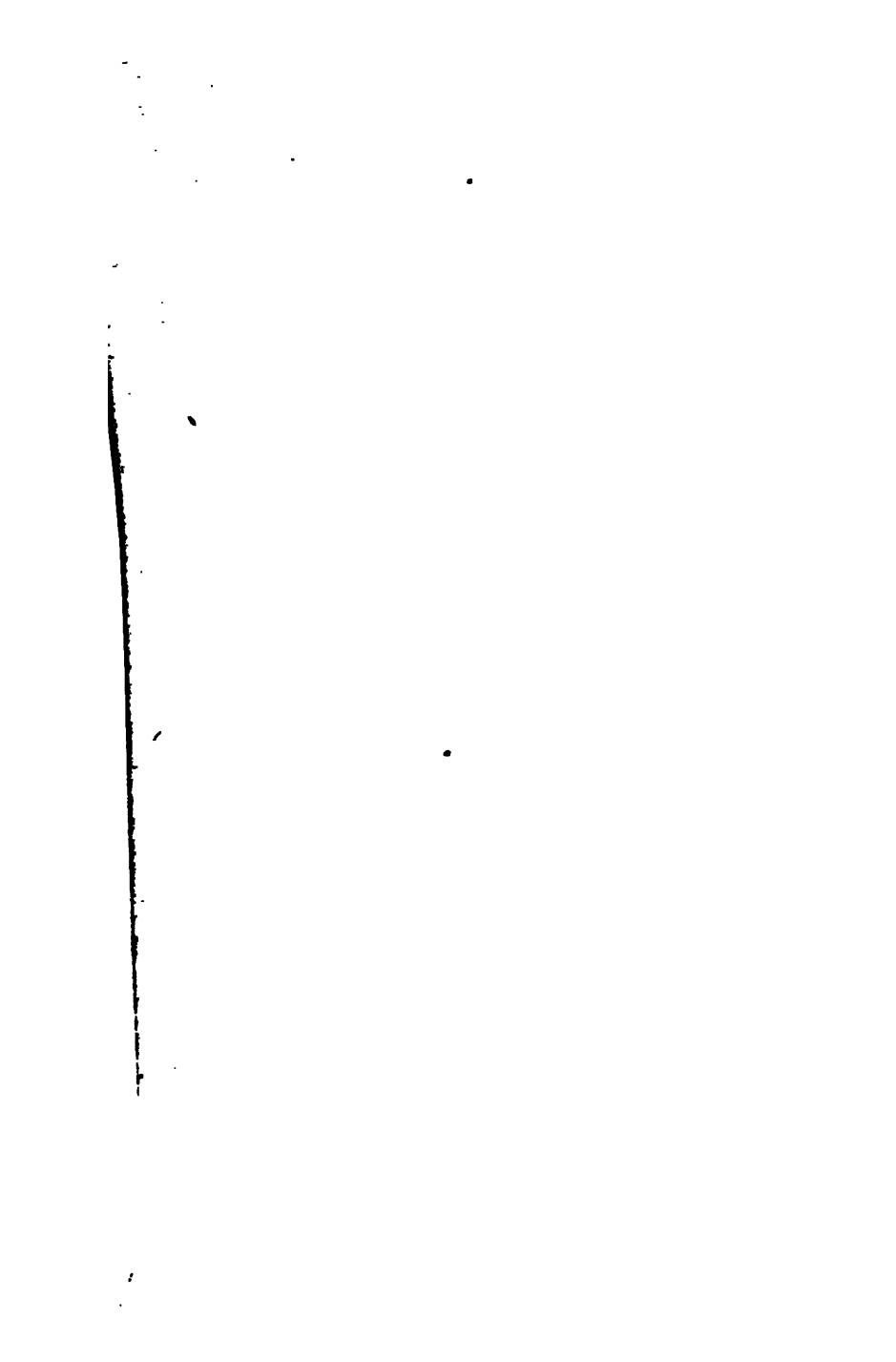
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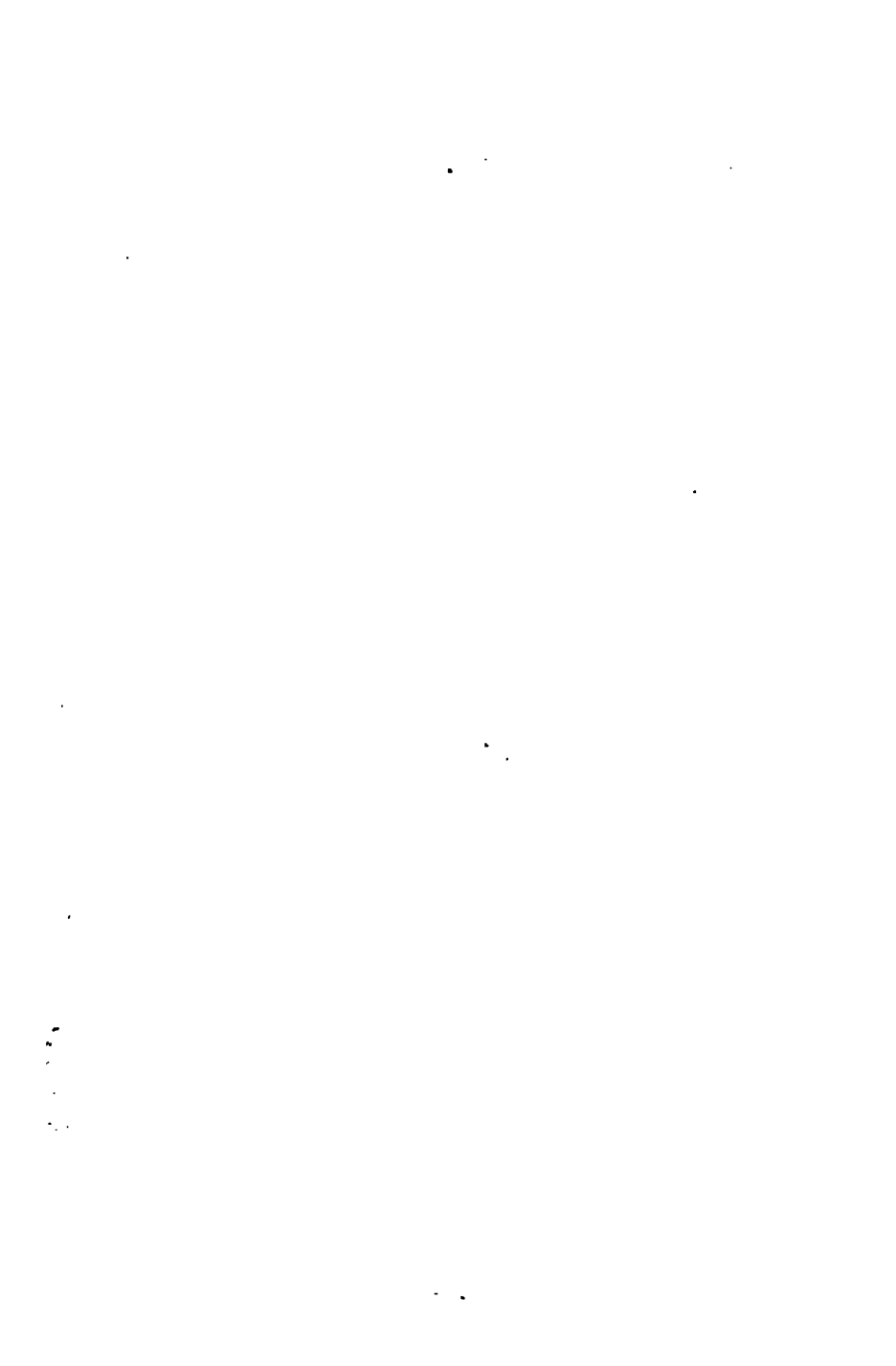
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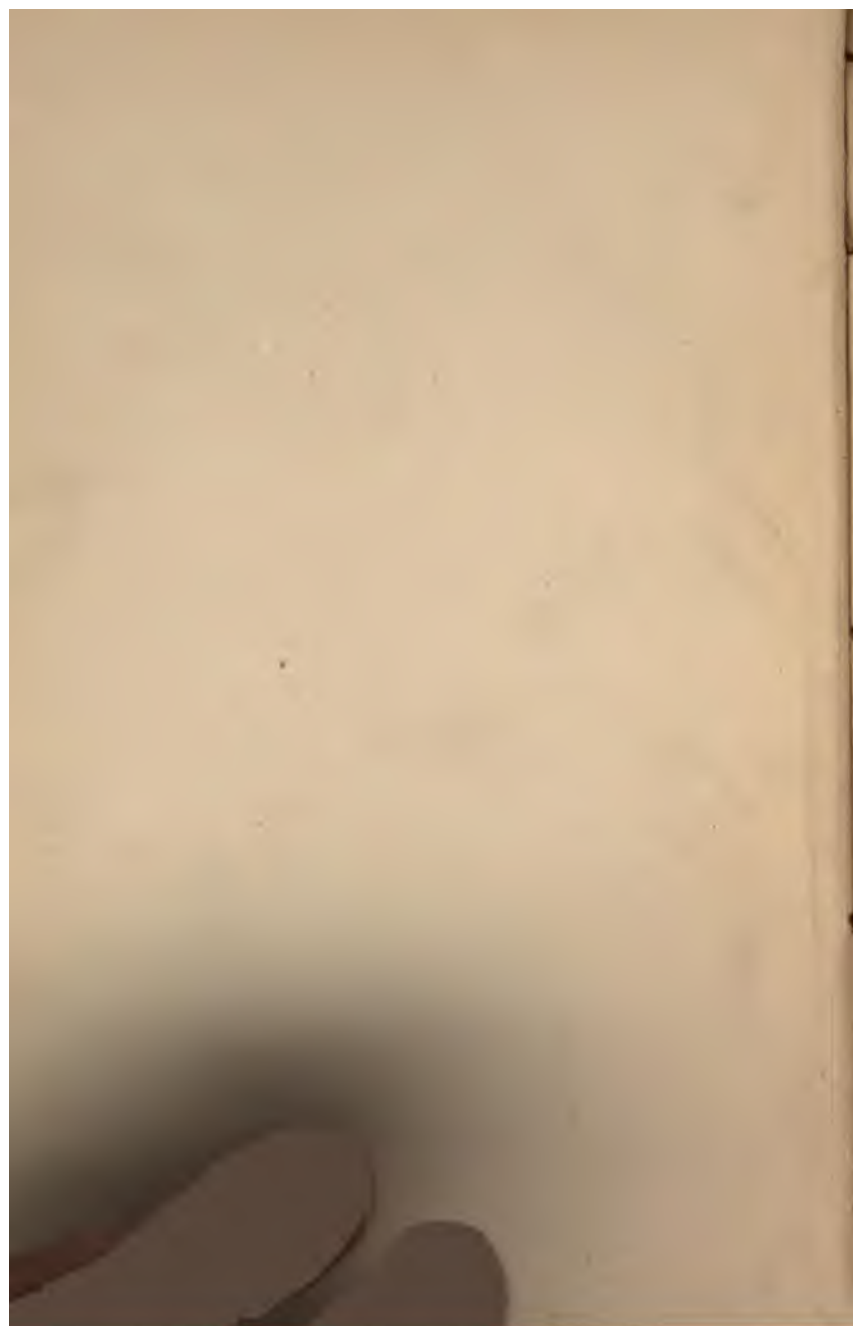
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LARYNGOSCOPY.

AND

RHINOSCOPY.

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# LARYNGOSCOPY

AND

## RHINOSCOPY

IN

THE DIAGNOSIS AND TREATMENT OF DISEASES

OF THE

THROAT AND NOSE.

BY

PROSSER JAMES, M.D.,

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## PREFACE.

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THIS little manual has been long out of print owing to my reluctance to allow it to re-appear without adequate revision.

In the present edition considerable changes will be found, especially in the chapters devoted to Rhinoscopy, to Diagnosis, and to Therapeutics. Motor laryngeal affections have been more fully considered, but I have adhered to the simple classification formerly adopted. The section on Sensory neuroses has been expanded, and Prof. Elsberg's recent classification included. The indications for laryngoscopical medication have been more precisely stated, and new remedies introduced--notably Cucaïn, the properties of which have been described as observed in my own experiments, while its various uses are pointed out in different chapters.

Many new woodcuts have been added, and the coloured plates have been still further modified--some of them re-engraved--in the hope of rendering them more worthy of the commendation bestowed upon each of the previous issues.

PROSSER JAMES.



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# LARYNGOSCOPY.

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## I.

### APPARATUS.

Laryngoscopy. Early use of Mirrors by Dentists. Reflected Light. Shapes of Laryngeal Mirrors. Supports of Reflectors. The Light. Forms of Lamps. Direct Light. Concentrators. Accessories. Tongue Depressors, &c.

LARYNGOSCOPY (*Λάρυγξ, σκοπέω*) is the art of examining the interior of the larynx. This is accomplished by means of a mirror sometimes called the laryngoscope, but this name is more usually assigned to the complete apparatus used to obtain a view of the larynx.

It is obvious that a dark cavity situated in such a position as the organ of voice can only be seen in the living person by the aid of a reflector. In fact, in the practice of laryngoscopy we do not look at the interior of the larynx itself but at its image in a mirror.

The laryngoscope, then, is only a contrivance to enable us, so to say, to see round a corner, and it is a little remarkable considering the length of time

that reflectors have been employed for similar purposes, that physicians should not long ago have availed themselves of the same principle.

In its very simplest form the laryngoscope may be said to exist in the mirrors used by dentists, and indeed the earliest efforts at laryngoscopy consisted in the use of such mirrors mounted on a long handle. The difficulty was so to place the patient as to allow sufficient light to fall upon the mirror, and practically this was not attained until a second mirror was used to reflect the rays and direct them upon the first.

This was essentially the starting point of laryngoscopy. Nevertheless, the simpler method of utilising the direct rays of light involves the principle of the laryngoscope, and those who persevered in the attempt thus to obtain a view of the larynx, are entitled to the credit of having in some degree contributed to the progress of the art.

A second great step in advance was the employment of artificial light, for this being always at command, experiments could be carried on at any hour and in any room.

As soon as this step was taken the modern laryngoscope may be said to have been completed; for the many variations in the shape of the mirrors, the mode of supporting the reflector or the lamp, can scarcely claim to do more than render the apparatus more convenient.

This brings us to a consideration of the several forms of laryngoscope in common use. To describe them it is necessary to take each portion separately.

The most important part of the apparatus—the laryngoscope itself, so to say—is the faucial or laryngeal mirror, as it is designated. It consists of a plane reflector mounted on a long stem. It may therefore, be made of silvered glass, of burnished steel, or any other good reflecting surface. Steel, however, is very apt to rust, and ordinary looking-glass is therefore most commonly used. (Figs. 1 to 7.)



FIG. 1. FIG. 2. FIG. 3. FIG. 4. FIG. 5. FIG. 6. FIG. 7.



The shape of these mirrors has been discussed with some gravity, but is a matter of little importance. Some prefer them round, others think square, with the corners rounded, more convenient. Others maintain oval ones to be best. Square mirrors are preferred by many French authorities, but round ones are more commonly used in England. It is easy to see with either. Where the tonsils are enlarged an oblong shape may be essential, and in a few other cases it is very convenient.

The shape of the stem is equally a point of little importance. The mirrors may be mounted on a handle, similar to an ordinary penholder, or they may be furnished with any other stem.

It will be seen that a single handle may be made to serve by means of a screw for various sizes of mirrors, (Figs. 1 and 3). This is convenient for portability. To increase this convenience I have had them made to slide in the whole length of the handle, an improvement that has been adopted by many. I have also had made a much more slender handle, bent near the end, and terminating in a ring, by which it can be held with a thumb and finger (Fig. 7). This slender handle may be in the form of a tube with a telescopic slide. This is the most portable instrument made. It will be seen that the mirrors are mounted at angles of about 120 degrees. This is the most convenient for general use, and it can easily be varied by bending the flexible stem to suit special cases. In hospital practice it is better to have a large number of mirrors, mounted at different angles and of all sizes; but for ordinary

cases the three sizes depicted, and the angle mentioned will suffice.

The next part of the apparatus is the reflector (Fig. 8). This is only a concave mirror, by means of which we can divert the light wherever we please. Whether it should be perforated in the centre, like the ophthalmoscope, has excited some controversy. The moveable stem in Fig. 8 slides into the stand or other support.

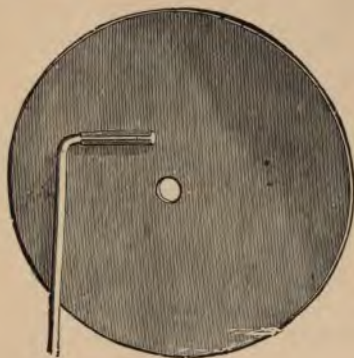


FIG. 8.

The mode in which the reflector is supported is the next point. I have tried all plans, and am not particular which I use. In the early days of laryngoscopy I had a reflector mounted on a distinct stem to stand on a table (Fig. 15, p. 21). I still sometimes employ it in the consulting room; but it is not portable in comparison with other modes. Czermak had a mouthpiece to hold it by the teeth, and Messrs Weiss made me an instrument on his model, which I have used for many years. It is not easy for those whose

teeth are defective. Semeleder, Stellwag, and others had the reflector mounted on a pair of strong spectacle frames, without the upper rim. These frames can also be fitted with a suitable concave or convex lens to suit the sight of any operator, or with a pair of different focus for persons who are very binocular. This I consider important, as many persons require a correcting lens. Indeed, in teaching, I become more and more convinced of the importance of the learner adopting such a lens as may be desirable, even though his vision be such as he may have previously consi-



FIG. 9.

dered normal: A small lens may be fixed at the back of the reflector by a pivot, which permits it to be moved, as in Fig. 9, or several lenses may be fixed in a revolving diaphragm, as in demonstrating ophthalmoscopes.

Schrötter prefers Kramer's forehead-band, and in this he is supported by Dr. Johnson, who also dispenses



with the central perforation. That the forehead-band forms a good support, and is easy to use, is undeniable. The illustration (Fig. 10) will serve as a sufficient description, *a* being the reflector, supported by band, *b d*, which can be lengthened or shortened by buckles *c c*. The forehead-band may also be used to support the reflector when it is perforated and placed before the observer's eye as in Fig. 11.

That the mode of supporting the reflector is of little consequence becomes more manifest when we remember that reflection can be dispensed with altogether. As already stated, we can practice laryngoscopy by means of direct light alone. If the laryngeal mirror be properly held, a beam of light, from any source, falling upon it is sufficient to furnish an image of the



FIG. 10.

larynx. The difficulty is for the observer to look at the mirror without intercepting the rays of light by his own head. This is why it is easier to sit before a looking-glass and examine one's own larynx by direct light. For this purpose the solar rays may be employed when obtainable, but in all cases artificial light is more manageable.

The light of an ordinary moderator lamp is sufficient



for illuminating the larynx. In fact, it is with such a light that some of the most valuable discoveries have been made. Where gas is laid on, a good argand burner is most convenient. The light from either of these may be increased by an ordinary metal reflector placed behind; or in place of the ordinary glass chimney a metal one, with an aperture on one side, will not only increase the light at the operator's dis-



FIG. II.

posal, but prevent its diffusion through the room, and thus obviously afford a clearer view of the image. Further, if a plano-convex lens be fitted into the aperture of such a chimney, it constitutes at once a simple and efficient light concentrator. This mode has been adopted by many laryngoscopists for obtaining a good light for ordinary use with a reflector, and may advantageously be supported by Mackenzie's rack-movement bracket, as seen in Fig. 21, p. 27.

In some early experiments with direct light I employed a small lamp with a single lens on one side, and a reflector at the back—a lantern, in fact, such as that used by policemen, and sometimes for railway signals. Tobold's apparatus, which contains three lenses adjusted in a tube, may be also used for experiments with direct light, and it is now made much more portable than formerly.

Dr. Cadier's contrivance (Fig. 12), for use with an ordinary table lamp, is only a light concentrator on the same plan. It consists of a pair of lenses enclosed

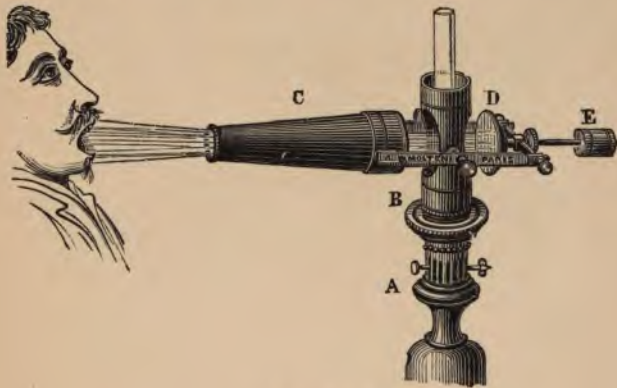


FIG. 12.

in a tube (C) attached to the lamp (A) by a socket (B), fixed by a pair of pivots to regulate the height. A reflector (D) and a counterpoise (E) complete the instrument,

A good lens attached to a pair of spring forceps that will clasp any lamp, serves also as a simple appa-

ratus for the use of direct light. Such an instrument is sold as Dr. Johnson's. Dr. Fauvel, of Paris, has improved upon this by devising a very simple and portable laryngoscopic lamp, the use of which is shown in the annexed engraving (Fig. 13).

This instrument can be used in any position. The illumination is obtained by direct light, passing from the lamp through the lens (*a*). A tongue-clasp is also attached, but this is not often required. The little



FIG. 13.

lamp is very useful for examining a patient in the recumbent position; but this can be dispensed with, and the Fauvel lens used with any lamp, thus combining the advantages of this apparatus with those of Dr. Johnson's. The little plane mirror (*c*) above the lens may be placed at such an angle as to let the

on larynx. This mode may therefore



I have tried to utilise the magnesium light for laryngoscopy, but it is very unmanageable. I have for a long time employed the oxyhydrogen lamp, which furnishes a good light equally available for use directly or by reflection. At the Hospital for Diseases of the Throat there is a very good lamp of this kind, which is useful for demonstrations, the direct rays being always employed. It is too large for the private consulting room, but for hospital use is of great value.

But the purest and brightest artificial light of all is the electric. The difficulty of employing it is that so few electric lamps are simple in construction and therefore easily managed. Mr. Browning has dispensed with all clock-work in his electric lamp, but in addition to its cost, it requires a powerful battery—from twenty to forty large cells—and that in turn demands much attention. The recent advances in electric lighting promise well for the future, but at present there is no economical electric lamp suited for our purpose.

For ordinary use, then, we are driven to the conclusion that gas is the most convenient source of light, and the brilliancy of this can always be increased by burning with it a small proportion of oxygen. A small safety apparatus for this purpose can easily be affixed to the burner.

Instead of a lens a glass globe, filled with water, may be placed before the lamp. Türck appears to have been the first to try this mode of illumination, which is still constantly used by Stoerk, one of the most able teachers of laryngoscopy. As a support,

Türk used a single rod, so bent as to cause the centre of gravity of the globe to fall about the middle of the heavy foot. Stoerk suspends the globe from the top of the frame by a screw, which enables him easily to alter its height (Fig. 14).

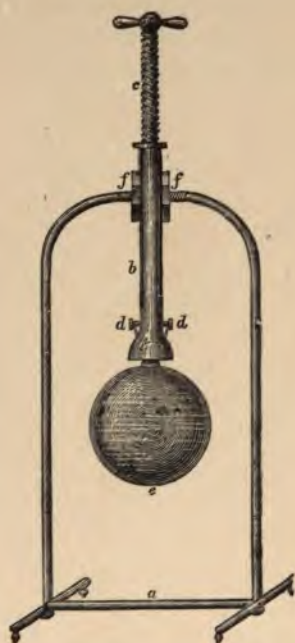


FIG. 14.

*a*, foot ; *b*, support ; *c*, screw to adjust height ; *d*, adjusting nut ;  
*e*, globe ; *ff*, joints.

Dr. T. J. Walker, of Peterborough, modified this apparatus by suspending the globe from a cross-bar,

which is supported by two upright metal rods. Moreover, he added to it a small plane mirror, thus enabling the operator to examine his own larynx, and at the same time show it to others.

From the dawn of laryngoscopy—before Czermak's book was translated—I have used a reflector supported on an upright rod, the upper half of which slides into the lower, for varying the height (Figs. 15 and 21); and this method has been adopted by several others.



FIG. 15.

These instruments are all more or less adapted for demonstration. Dr. Smyly, of Dublin, for this purpose, uses a perforated reflector supported by a fore-

head-band, to which is fixed a square plane mirror. The reflector is fixed as usual before either eye, the other being covered by the square mirror into which



FIG. 16.

the pupil or the patient himself looks, as is very well seen in the engraving (Fig. 16).

Among accessory apparatus, tongue depressors of



FIG. 17.



various shapes are employed. Those resembling a paper knife are the most simple (Fig. 17), but like the common double folding one they are unsatisfactory, both for laryngoscopy and other purposes.

Before the discovery of the laryngoscope I had constructed an oval-bladed depressor, which holds the tongue firmly. The blades were of two sizes, and screwed into an ebony handle. The instrument is therefore portable. This tongue depressor (Fig. 18)



FIG. 18.

is the most convenient instrument for rhinoscopy, as the examination of the posterior nares by means of the faucial mirror is called. Türck's depressor is stronger, and for operative procedures more complete,



but it is less portable. The patient can easily hold it in position himself. Voltolini's is also an excellent instrument.



FIG. 19.



FIG. 20.

Leiter, of Vienna, makes a depressor consisting of Türck's hooked handle, furnished with blades of the shape depicted in Fig. 19.

I have so modified the last-named instruments as to make them much more generally useful. I have the hooked handle made more slender than usual, and the blades fitted by a circular shoulder instead of a square one. They can therefore be fixed in any position by a mere turn of the screw. Fig. 20 shows this depressor with two blades, but of course additional ones may be had if required: useful as it is for operative purposes, it is seldom required for diagnosis.

---

## II.

### THE PRACTICE OF LARYNGOSCOPY.

Position of the Patient and Physician. Warming and Introducing the Mirror. Cautions and Directions.

To obtain a view of the interior of the larynx the operator, seated in front of the patient, has only to place in the fauces the warmed laryngoscope and direct a stream of light upon it. The most convenient position is for the patient to sit upright with the head leaning very slightly backwards. The distance of the physician from the patient should be such that the reflector brings the light to a focus, about the base of the uvula. With the ordinary sized reflector this will be from thirteen to fifteen inches. The lamp may be on either side of the patient according as the reflector is before the left or right eye of the observer. The flame should be above the level of the patient's eyes. The exact position of the lamp is a point of detail that is of little moment ; for the observer soon learns so to place it as to receive the light on his reflector, from which he can throw it in any direction. The light being thus under control, the patient opens the mouth as widely as possible ; the rays are brought

to a focus in the fauces; the laryngeal mirror is warmed, and at once so placed as to gently press the uvula backwards and upwards. The position of the parties is clearly shown in the engraving (Fig. 21) which represents the simplest method of laryngoscopy by reflected artificial light, and has been accurately copied from a photograph taken for me many years



FIG. 21.

ago. A few patients can completely display the fauces, holding the tongue well down all the time. But such entire control is rare, and in the majority of persons the tongue involuntarily arches itself,



and renders it impossible to see the fauces. Even when the fauces can be fully displayed, it is desirable in order to get a good view of the larynx, for the tongue to be protruded so as to raise the epiglottis as much as possible.

For ordinary laryngoscopy, therefore, the best plan is to direct the patient to put out his tongue, and for the operator to hold it gently but firmly with the thumb and forefinger covered with a small napkin. This prevents it from slipping, and a clean one can be used for every patient. It is not necessary to drag upon the organ, and the finger should be kept just above the level of the teeth to prevent them from injuring its under surface.

It is absolutely necessary to warm the laryngeal mirror, or the moisture of the breath will at once condense upon it and obscure the view. It may easily be held for a few seconds over the chimney of the lamp.

When direct light is used a small spirit lamp in any convenient position will serve the same purpose. The temperature is to be invariably tried on the back of the operator's hand, or on his face, for if it be so hot as to burn the patient he will naturally lose confidence in the physician, and perhaps decline a second attempt. In holding the mirror over the lamp a film of moisture momentarily condenses upon it, and at once clears off. It is then warm enough, but may be too hot. Hence the necessity for the precaution named.

The mirror, when warm, should be carried boldly forwards into the fauces, particular care being taken

not to touch the tongue, as that will be likely to excite retching. The posterior surface of the mirror should push the uvula *without hesitation* somewhat backwards and upwards. There is no fear that this will cause irritation, while a trembling hesitating way of holding it only produces an unbearable tickling. I have known many beginners utterly fail from tremulousness. The throat is far more tolerant of the contact of instruments thus suddenly pressing against it, than of the vibrations of a body held unsteadily. Of course force is not needed, but some degree of pressure is less intolerable than tickling.

---

### III.

#### THE LARYNGEAL IMAGE.

**The Vocal Cords. Other Parts Reflected. Parts of the Cavity of the Larynx. Appearance of the Cords.**

WHEN the mirror has been introduced and the full light directed upon it the operator will have a view of the parts in the line of reflection.

If the directions already given have been followed and the conformation of the parts be normal, an image of the interior of the larynx occupies the mirror, the vocal cords arresting attention by their movement as well as by their white colour, which is in striking contrast with the surrounding parts.

If the mirror should not have been carried far enough back—a common error with beginners—or if it be otherwise improperly placed, of course this view will not be obtained. In the former case rectification is easy, in the latter the mirror should be withdrawn and reintroduced.

It is not uncommon for the beginner to see only the base of the tongue and upper surface of the epiglottis, or if he have carried his mirror far enough he may even then only see the under surface of the epiglottis.

I have even known the mirror to be so held at first as only to reflect some of the teeth, and yet the learner has very soon become an efficient laryngoscopist. To some beginners, the sudden appearance of the teeth instead of the vocal cords in the mirror, is quite startling. A moment's consideration of how they are holding the mirror removes their perplexity.

The view, moreover, will vary somewhat with the conformation of the individual, but most of all with the angle at which the mirror is held, and this may be varied to any extent.

A single demonstration will suffice to teach a pupil so to hold the mirror as to see the vocal cords in action. It is easier, in fact, for a student to learn this from a competent professor than to comprehend and appreciate the printed directions.

I first speak of the vocal cords, because in his very first lesson the student ought to see them distinctly and notice their movement. From that moment he will never forget their appearance, and he will feel more interest in his work; moreover, they will serve as landmarks for the study of other parts of the larynx. The laryngeal image is seen in the next engraving (Fig. 22), in which are represented nearly all the parts likely to come into view in the attempt to see the interior of the larynx. The laryngeal image, as seen in a moderate-sized mirror, is included in the dotted circle. This engraving is copied from Türck (*a*), with the exception of the dotted circle, which was added by Dr. Walker (*b*). Several parts, such as the

(*a*) Klinik der Krankheiten des Kehlkopfes. Wien., 1866.

(*b*) The Laryngoscope in its Clinical Applications.



base of the tongue, will at once be recognised, while the rest of the laryngeal image is tolerably complete. Thus the letter *g* points to one of the true vocal cords, while *h* indicates one of the so-called false cords; *i* is the glottis, or, as it is also called, the rima glottidis or opening between the true cords; *e*, the arytænoid



FIG. 22.

Base of Tongue and Larynx. *a a*. Epiglottis; *a*. Its lip; *a*. Its anterior surface; *b*. Glosso-epiglottic ligament; *c*. Vallecule; *e*. Arytænoid cartilage surmounted by the cartilage of Santorini; *f*. Cartilage of Wrisberg; *g*. True vocal cord; *h*. False vocal cord; *i*. Rima glottidis; *k*. Outer surface of arytaeno-epiglottic folds; *l*. Inner surface of wall of pharynx.

cartilage surmounted by the capitulum Santorini, and close to this is the cartilage of Wrisberg, *f*. The epiglottis is marked *a á*, the lip being *a*, the anterior surface *á*, *b* is the glosso-epiglottic ligament, and *c* the vallecula.

It may be thought that the crowding of these parts into one engraving is unnatural. Still the figure gives a fair idea of the relative position of the parts likely to be reflected in the mirror during the student's early attempts to explore the larynx, while the dotted circle directs his attention to the ordinary laryngeal image. With every detail of this image he must be thoroughly familiar, and he will find that in the normal condition it varies considerably in different persons. Moreover, he will be prepared to watch its extensive changes during respiration and phonation. To assist in the recognition of the several parts an unlettered engraving of a laryngeal image is added (Fig. 23).

This, it will be observed, is a fuller view than the preceding one. The cushion of the epiglottis is distinctly seen immediately under its lip. The glottis itself is not quite so open, and there are some other differences between the two figures of which the student should make a careful comparison.

I have already remarked that the vocal cords are in remarkable contrast with other parts. It is impossible, therefore, to mistake them. They appear as two flattish, white bands connecting the base of the arytaenoid cartilages with the angle of the thyroid cartilage. They are seen to move with the respiration, opening widely in inspiration and partly closing

in expiration, but the movement is most posteriorly, where the separation may be from a quarter to half an inch in distance. The angle at the base of the arytaenoid cartilages into which the cords are inserted is called the *processus vocalis*. As the vocal cords approximate this angle is turned inwards, but when



FIG. 23.

they separate it turns outwards, so that in inspiration the glottis has what has been called a lozenge-shape. The vocal process above described served Longet for a division for the glottis into the inter-cartilaginous and inter-ligamentous portions.

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#### IV.

##### DIFFICULTIES AND OBSTACLES.

Movement of Mirror. Retching. Arching or Thickness of the Tongue. Enlarged Tonsils. Irritability of the Fauces and Means of relieving this Condition. The Uvula—its Elongation, &c. Rigidity of the Velum. The Epiglottis—its Form and Position, &c. Faulty Instruments. Defects in Observer's Sight. Timidity of Patients, especially Children.

EXPERIENCED laryngoscopists will often place the mirror in the fauces so accurately as to obtain instantaneous views of the vocal cords in a number of cases successively. But even those in constant practice do not always thus easily succeed, though the movements they make after the mirror touches the uvula may be so slight and so rapid as to be almost unnoticed. On the other hand the beginner cannot expect to become an expert in his first lesson, and he will acquire the necessary tact more easily by deliberate movements than by any attempt at rapidity. If the image of the vocal cords does not appear at once, the position of the mirror must be altered to a slight extent. A common mistake is to move it too much, a very slight movement deflecting the rays of light to a consider-



able distance. This fact may be illustrated by the following engraving (Fig. 24), in which M represents the position of the faucial mirror, and G that of the glottis. A ray of light from the observer's eye falling upon the mirror M is reflected to the glottis G, of which an image appears at M. A very slight inclination of the mirror may throw the light along either of the dotted lines, in which case the image of G will be replaced by another, A or E, as the case may be.

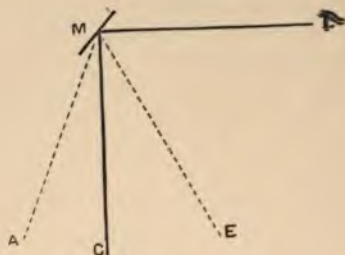


FIG. 24.

The most likely movement to be required is a slight elevation of the hand. If too near the centre and in the way of the light, the hand must at the same moment pass nearer to the corner of the mouth. This movement is seldom required with my rectangular-handled mirrors, hence they are sometimes found easier to use by learners. Whatever movement be necessary should be made deliberately and continuously, not in jerks. It can then be arrested the moment the laryngeal image is brought into view. There can be

no objection to resting one or two fingers on the patient's cheek in order to steady the hand; but with practice many will find this unnecessary.

The mirror should not be kept too long at a time in the patient's mouth, nor should it be moved about too much. Retching is not so likely to be produced by two or three separate introductions. In fact, timid patients gain confidence as they find the mirror can be introduced without inconveniencing them.

This retching—the dread of patients who have never been examined by the laryngoscope, and the bugbear of those who are learning to use the instrument—is most likely to be excited by touching the tongue with the mirror. Bearing this in mind, the error will mostly be easily avoided. Another reason for care in this respect, is that the mirror becomes covered with secretion, and its reflecting power thereby diminished or even destroyed. On the other hand, while avoiding the tongue by carrying the mirror high enough, we should not let it actually touch the palate. It is, in fact, to be carried between the tongue and roof of the mouth, touching nothing until it comes in contact with the uvula. I have known beginners derive some assistance by letting the stem slide along the upper front teeth, and in a difficult case this may be done, but practice soon makes it unnecessary.

Occasionally the uvula is itself found in contact with the tongue. In this case the patient is to be requested to take a deep breath, or to say "a" (or emit any other vowel sound), as during that act the uvula is raised, and so the mirror more easily placed.

The same plan should be adopted when the tongue



involuntarily arches itself so much as to almost fill the mouth, and also in cases in which the root of the tongue seems preternaturally thick.

In the majority of cases the arching of the tongue is due to apprehension on the part of the patient, or inability to control its movements. Sir Thomas Watson used to recommend in such cases, that the patient should practise before a looking-glass. It is easy thus to acquire the art of keeping the tongue in such a position as to admit of the introduction of the laryngoscope or other instrument in the simplest manner, as already shown.

But such complete command is unnecessary, and to acquire it occupies time. The best way is to tell the patient to put out his tongue, and to hold the protruded organ between the thumb and forefinger of the left hand covered with a napkin. This plan practised with the utmost gentleness very seldom fails. (Fig. 21, page 27.)

The patient should also be told to breathe through the mouth, and not through the nose.

A very nervous patient may be advantageously set to hold the tongue himself. This diverts his attention, and should local treatment become necessary, the physician will want both his hands free.

In exceptional cases, especially in those in which the root of the tongue is unusually thick, it has been proposed to hold it by a variety of instruments. Of these, Labordette's *Spéculum laryngien* has been most used, but like many similar contrivances, has not met with general favour. It is somewhat complicated, necessitates a degree of force not so

completely perceptible to the physician as it should be, and is not unlikely itself to excite vomiting or some other inconvenience.

Instead of an instrument of any kind the physician's forefinger can be used, and some operators have almost entirely discarded the use of tongue depressors. It appears to me, however, that some kind of instrument is often preferable and its use seems more delicate. If "fingers were made before forks" we have not therefore dispensed with silver at table.

If any instrument be used to control the tongue it cannot be too simple. It is this quality that constitutes the value of my tongue depressor, which is so easily managed that with little practice it becomes, so to say, a mere addition to the physician's fingers. But even this is more useful for rhinoscopy than for laryngoscopy. I have dwelt thus upon the tongue, because that "unruly member" is so often regarded by beginners as the chief impediment to rapid progress in laryngoscopy. There are, however, some other difficulties which, if only to show that they are easily overcome, it may be as well to mention here.

One of these is enlarged tonsils. A moderate degree of hypertrophy is the chief cause for the use of oval mirrors, but sometimes these organs are so much enlarged as to give rise to considerable difficulty. They are then manifestly in a condition to require treatment, which should not be delayed, unless some contra-indication exists.

Great irritability of the fauces occasionally proves an obstacle, to overcome which requires tact on the

part of the physician, and confidence on that of the patient. Many cases yield to the simple plan of sucking ice for a few minutes before the introduction of the mirror. When time is not of importance the patient may educate himself before a looking-glass, and gradually accustom the throat to the contact of instruments. Some have recommended painting the fauces with various local astringents, or saturating the sponge probang with them, and applying it from time to time. A better method of employing these remedies is by means of the atomiser. In fact, a patient educating himself will find a gargle, or a spray of great service. A whiff of chloroform or ether has been proposed, but can seldom be justified. *Cacain* as a local anæsthetic is safe and efficient; as to this remedy, see *Laryngoscopical Therapeutics*. Chap. xi.

The internal use of the bromides has also been recommended. There is no doubt that anæsthesia of the fauces, more or less complete, may be produced by these drugs in large doses, but they must be pushed to the point of saturating the system in order to attain the end, and few would think it right to subject a patient to bromism for this purpose. The use of small doses is as futile as the employment of gargles containing a little bromide, on which some have depended.

An irritable condition of the fauces is common in some stages of congestion and inflammation. The local remedies for these diseases are then the best applications. In laryngeal phthisis there is often great irritability, and this is mostly relieved by inhalations of atomised sprays, or of such soothing



vapours as may otherwise be indicated. Tact and gentleness will, in these cases, as well as in physiological irritability, almost always succeed if the directions as to respiration, vocalisation, and other points be carefully followed.

The uvula occasionally proves an obstacle to laryngoscopy. Apart from irritability, in reference to which the remarks made on that condition of the fauces generally are equally applicable, the uvula may interfere with our procedure, either from its unusual size or shape. Its size may be increased in either direction, but elongation is more apt than thickness to interfere with inspection. It is no uncommon occurrence in a case with an elongated uvula for the pupil to find its tip descend considerably below the inferior border of his mirror, in which accordingly it is reflected. This difficulty is by no means insurmountable. The use of a larger mirror will often at once overcome it. If not, the directions already given as to inspiration and vocalisation can then be carried out, and the mirror placed rapidly on the retracted uvula.

The late Dr. Mandl devised a small pocket at the back of the mirror to catch the tip of the uvula and support it. This instrument is simple and inoffensive. Others have employed various kinds of forceps and elevators, such as are sometimes used in rhinoscopy.

Some German writers recommend passing a ligature round it to fix it—a proceeding Englishmen do not approve. If the uvula be so long or so thick as to prove a considerable obstacle to laryngoscopy,

the physician should ask himself whether it be not in such a condition as to call for treatment.

Here it may be well to mention that some have mistaken for elongated uvula, a natural conformation of the parts in which the opening of the pharynx is large, and the uvula from its distance liable to fall before the mirror. This is more likely to occur if the pupil carry his mirror too far back, or attempt to support it against the pharyngeal wall. In reference to form, the uvula varies considerably, its tip sometimes being enlarged in all directions so as to form a ball at the end. Occasionally it is bifid. In all these cases choose the largest mirror for which there is room, and if necessary support it by its handle against the teeth, or by the little finger resting on the patient's cheek, and make your examination while the patient takes a deep inspiration, and then utters a falsetto note.

The same position and support of the mirror will suffice to overcome the next difficulty—that which occurs from rigidity, not only of the uvula, but of the whole *velum pendulum palati*. This condition is mostly due to old disease, the cicatrices of which are visible. They narrow the pharyngeal aperture, and too small a mirror is apt to slip behind the velum. A large one should therefore be used, and support, if required, afforded outside. Where actual contact of the velum with the pharyngeal wall, or even adhesion is present, the conditions are somewhat different; but similar directions will suffice for the examination.

The epiglottis sometimes proves the greatest obstacle of all to laryngoscopy. This valve varies much



in shape, in size, and in position, and in either of these respects may be a source of inconvenience. Instead of the shape it has already been depicted, it is sometimes asymmetrical; it is often doubled upon itself to a varying extent. In these cases the illumination of the larynx is interfered with, and we may only see one vocal cord at a time by inclining the mirror more or less to one side. Position is still more important, for if the epiglottis be too horizontal it necessarily intercepts the rays of light reflected from the mirror in the direction of the glottis. We may thus be prevented from seeing more than the arytaenoid cartilages. A glimpse of these is, however, often of great value, both for diagnosis and treatment.

The most common cause of difficulty is perhaps to be traced to relaxation of the glosso-epiglottidean ligaments, permitting too great pendency of the valve. The opposite cause, however, must not be forgotten—viz., contraction or swelling of the arytaeno-epiglottic folds holding down the valve. These variations are, of course, pathological, but the natural conformation and position of the epiglottis give rise to quite as many differences. Indeed, the student should be prepared to find the epiglottis in healthy subjects varying greatly in shape, size, and position.

The difficulties caused by the epiglottis being so diverse in their origin are obviously to be met by equally varied methods, and these will exercise the student and bring out all his resources. A great number of plans have been vaunted, but no one of them can meet all the various conditions. The object is to throw the light into the larynx, and, as already

pointed out, the slightest variation in the position of the mirror suffices to deflect the rays to a considerable extent. Not only so, but any change of position, either of the observer or of the patient, must bring about changes in the relative position of the plane of the mirror, and that of the opening of the larynx. Thus, as in ordinary cases, we very slightly incline the head of the patient, we can, in order to meet these contingencies, either raise or depress the chin to a greater extent, so as to incline the head backwards or forwards. Such movements give a very wide range of changes. Sometimes it may be advisable further to so far change the position of patient and physician as to let the observer's eye be on a lower level than the patient's chin. He thus, as it were, looks somewhat upwards instead of downwards. In this case the patient's head is inclined forwards, and as large a mirror as convenient should be held almost or even quite horizontally immediately under the uvula, and as far from the pharyngeal wall as possible.

The reverse disposition of the parties is more frequently called for, the patient being placed on a lower level than usual, his head inclined backwards. In this case the mirror should be carried as far back as possible, and it may be necessary to change its angle somewhat. Occasionally it must even form a right angle with the stem,

Again, it is possible to change the position of the patient's larynx by manipulating the thyroid cartilage or the hyoid bone, as proposed by Türck.

The above plans all aim at changing the relative position of the mirror and the glottis. This they do

indirectly, and so to say mechanically. The same end may often be obtained by a physiological method—so to say—that is, we may take advantage of the changes brought about by respiration. Thus, sometimes deep and slow inspiration suffices; at others, the patient must be made to take a series of quick, short inspirations—to “catch his breath,” as it is said, or to draw his breath by a number of snatches. During these sudden movements the epiglottis rises, and we may get a glimpse of the glottis. In the same way a noisy inspiration—that is, a rather deep breath taken with a treble note—will sometimes reveal the parts. Moreover, the movements brought about in coughing, laughing, and retching, may be all taken advantage of.

It will thus be seen that patience, combined with a knowledge of the many changes to be brought about, enables us to cope with most unpromising cases. In the most obstinate the epiglottis may be raised mechanically. Occasionally, the left forefinger of the physician can reach the valve and support it for an instant. If an instrument be employed it cannot be too simple. A laryngeal sound will often suffice. If not, the epiglottic pincette of Fournié or Mackenzie may be used. That of Bruns is armed with teeth which are as unnecessary as they are objectionable. Others of the German school have adopted the barbarous plan of passing a ligature through the epiglottis, in order to hold it up for the inspection. I am glad that no English writer recommends this unjustifiable proceeding.

There are some other obstacles which have been commonly ranged under the head of difficulties, and



which may therefore be mentioned, although they are of less importance. Thus, the instruments are occasionally at fault—the laryngoscope may be mounted at an inconvenient angle, its surface may have become impaired by the heat or rough usage, and even the reflector may not bring the rays to a focus at a convenient distance. These and other inconveniences are the concern of the maker, but at the same time it is to be expected that every observer will attend to his own instruments. The same observation applies to the lamp. More frequently the observer is himself at fault, but if in the beginning he finds some difficulty from his own inexperience or want of tact, he may be quite sure that practice will remove it.

If, however, he be short-sighted, or the reverse, this defect should be corrected by appropriate glasses.

The use of ordinary spectacles is inconvenient with any of the portable reflectors, although they may easily be employed with my detached stand. As the forehead-band or spectacle-frame will be preferred by those who have not a room devoted to laryngoscopy, I have had lenses attached to these as already stated. (Fig. 9.) It is easy therefore to correct presbyopia or myopia.

Inexperienced patients sometimes put an obstacle in the way of the observer either by perversely persisting in taking an improper position or refusing to breathe calmly and steadily. A little patience and clear instruction, if necessary by way of example, is the only resource. Some patients will begin to take deep, forcible, and rapid inspirations, while others will

hold their breath altogether for a few seconds and then suddenly push away the hand of the observer. These, as well as timid patients, must be assured that laryngoscopy does not interfere with the respiration at all, and that all they have to do is to breathe quietly through the open mouth. In rare cases they may even be told to hold their own nose and so compel themselves to breathe through the mouth.

The greatest difficulty of all is presented in children of tender age and timid nature who cannot be brought to feel confidence that they are not going to be hurt. The means of overcoming this will suggest themselves to the reader. In spite of everything, we are sometimes baffled by children, or only able to obtain a rapid glimpse of the parts. Still it is surprising how often patience and tact will succeed. It is in these cases that the dexterity and rapidity of experienced observers stand them in such good stead, and enable them to get a view of what those unaccustomed to laryngoscopy find it impossible to see.

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## V.

### THEORY OF LARYNGOSCOPY.

Law of Reflection from a Plane Surface. Upper and Lower Parts of Image. Right and Left Side. Errors respecting Inversion.

IT is not my purpose here to enter upon the consideration of the laws of optics, some knowledge of which should be possessed by every professional man. But inasmuch as a great deal has been written upon the principles involved in the art of laryngoscopy, and numerous mistakes have been made, it seems well to state as briefly as possible the theory upon which that art depends.

Everyone is aware that a pencil of light falling upon a plane polished surface is reflected from it, and nearly every student will, if questioned about it, repeat the optical law that the angle of incidence is equal to the angle of reflection. This is the law on which laryngoscopy depends, but it is more frequently repeated than thought about. The practical application is easy enough, and very little thought

should prevent any one falling into the errors that some writers have committed. The student may advantageously amuse himself by correcting some of these as he stands before a pier-glass and puts to the test the statements made. In fact, a quarter of an hour before a looking-glass is one of the best preparations for a course of lessons in laryngoscopy, or may even be looked upon as the first lesson. By standing before a mirror and carefully watching every movement he makes, the student will learn to realise more exactly the laws of reflection and the position he will occupy when he comes to examine patients. This will be more fully exemplified as we proceed; for in the practice of laryngoscopy the physician merely observes the reflected image of his patient's larynx in a plane mirror. But it must not be forgotten that the little laryngeal mirror is held in the fauces in an oblique position forming an angle of about forty-five degrees with the horizon, and moreover that the plane of the opening of the larynx is also oblique. The opening is bounded in front by the epiglottis, which is also the highest point of the larynx, and so the most prominent, and as previously shown, the easiest to see in the laryngoscope. The arytaenoid cartilages, the next most prominent objects, are the lowest point. Between the two extremes are the arytaeno-epiglottidean folds. Now the relative position of these parts is just the same in the image seen in the laryngeal mirror. Thus, the epiglottis appears at the summit, the folds a little below, and the lowest of all the cartilages. (See Figs. 22 and 23, pp. 32 and 34.) There is not then any

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inversion, as some have supposed. It is in another direction we must seek for the change which has led to this misconception, and which we will now consider.

In Fig. 22 (p. 32) it will be noticed that the base of the tongue is depicted at the highest part of the engraving. By holding the page horizontally the reader will observe that this makes the tongue appear the farthest off, while in reality as he sits in front of a patient he knows the tongue must be nearest.

We are able, therefore, to represent a natural view of the parts by engraving the image in an inverted position (Fig. 25, page 51):—

By holding the page horizontally, the tongue is the nearest to the observer, the epiglottis comes next, and behind it is the glottis. This is the position of the parts as they actually exist in the patient, seated in front of the observer, but in the laryngeal mirror the position of the parts is reversed—the nearest becoming the most distant. This engraving should therefore be compared with Fig. 22 (p. 32), and afterwards with the following smaller cut. This (Fig. 26) represents the same parts except the base of the tongue, which I have not thought it necessary to re-engrave, especially as it is desirable to become accustomed to the appearance of the simple laryngeal view. Here we have the position of the parts as they appear in the laryngoscope, and as they are represented in all works on the subject, and this is the only inversion that takes place in the practice of laryngoscopy.

Some students come to us with a notion that there is a lateral inversion of the image in the laryngeal



mirror. There is no such thing. The idea can only result from a confusion of terms. Right and left are



FIG. 25.

Base of tongue and larynx. *a* *á*. Epiglottis ; *a*. Its lip ; *á*. Its anterior surface ; *b*. Glosso-epiglottic ligament ; *c*. Vallecula ; *e*. Arytaenoid cartilage surmounted by the cartilage of Santorini ; *f*. Cartilage of Wrisberg ; *g*. True vocal cord ; *h*. False vocal cord ; *i*. Rima glottidis ; *k*. Outer surface of arytaeno-epiglottic folds ; *l*. Inner surface of wall of pharynx.



FIG. 26.

Image seen in laryngoscope. Lettering as in Fig. 25.

words that each speaker is apt to refer to himself as a standard, but almost every clinical clerk is aware of the necessity of discriminating between the right or left side of the patient and himself. Rather ludicrous mistakes do, however, occur. For example, I have seen a gentleman listening on the right side of a patient's chest for the sounds of the heart, and another tapping the left epigastric region to elicit the dulness he was taught to seek for over the liver. The same confusion lurks in the error about lateral inversion in laryngoscopy. The physician sits opposite to the patient and looks at the image formed in the mirror held in the fauces. The right hand of the physician is therefore immediately opposite to the left hand of the patient. It is the same with every other part—the right foot or right eye of every observer is opposite the left of a person facing him. In learning the use of the ophthalmoscope, the student does not so readily fall into error, because it is so much more easy to correct himself, as he only examines one eye, right or left, at a time.

In the laryngeal mirror, however, he sees both vocal cords at once, but they are not inverted. He must remember that it is the image of the patient's cords he sees, not his own. The standard of right or left must therefore be referred to the patient, and then it will be manifest that as the left vocal cord of the patient is opposite the right of the physician, so it appears on what the observer calls the right side of the mirror, but what would be called by the patient its left side.

All this is readily seen in the plates; and it may



be rendered still plainer by the engravings on pages 53 and 55. The first, Fig. 27, shows the laryngeal image as reflected in the laryngoscope, while the one below, Fig. 28, displays the actual relation of the parts to each other in the patient's larynx. Figs. 30 and 31 represent the same on an enlarged scale.

FIG. 27.



FIG. 28.

*r* Right, and *l* Left vocal cord ; *ep* Epiglottis ; *c* Posterior commissure of glottis. An enlarged view is given on page 55.

The correctness of the foregoing statements respecting inversion admits of the easiest experimental proof at the hand of every reader. Standing in front of a swing toilet mirror, the upper part of which is inclined forwards, so as to represent the position of the laryngoscope in a patient's fauces, he has only to place this book on the stand, and examine the image of the engraving, Fig. 28, as reflected in the glass. He will thus satisfy himself of the accuracy of what I have said. Nor is an engraving necessary for the ex-

periment, though as it represents the parts to be seen it is more striking.

The letters on any page are reflected in exactly the same way. They appear in the glass upside down, but they do not read from right to left. There is no lateral reflection. We may illustrate this by the word glottis in the following diagram, which below (a) is naturally placed, but is seen in the glass as at (b).

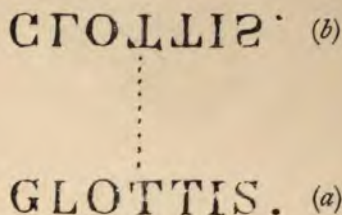


FIG. 29.

The same facts may be illustrated still more aptly by taking an ordinary laryngeal mirror and holding it over any of these pages in a similar oblique position. In that mirror the reader can examine the engravings which represent the parts *in situ*, e.g. 28 and 31, and see them just as he will see the patient's larynx; and the learner will find it excellent practice. Of course Figs. 27 and 30, as well as the plates, represent the image as seen in the laryngeal mirror. If less to the purpose, the reading of the letterpress thus reflected is both instructive and amusing.

FIG. 30.

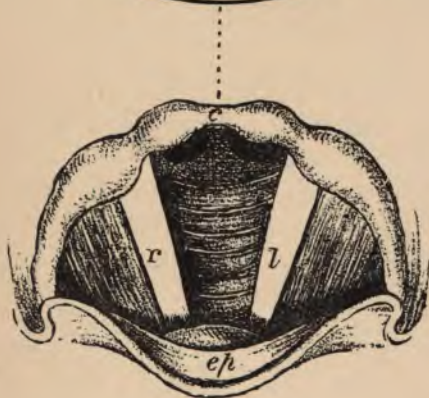
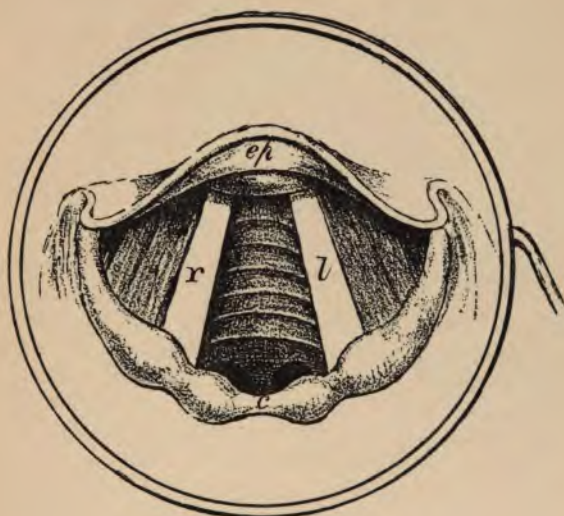


FIG. 31.

## VI.

### THE LARYNGEAL IMAGE—ITS PARTS.

The Vocal Cords. The Epiglottis—its Forms, its Ligaments, its Surfaces. The Arytænoid Cartilages. The Cornicula. The Cuneiform Cartilages. The False Vocal Cords. The Ventricles. The True Vocal Cords. The Glottis. The Inter-arytænoid Fold. The Trachea. The Bronchi. The Deviations in Form of the several Parts met with in Disease—from Loss of Substance, from Increase of Size of Parts, from New Growths. Tracheoscopy. Laryngostroboscopy.

IN describing the organ of voice as seen in the laryngoscope it is not necessary to enter into the details found in the usual text-books of anatomy. The image at which we gaze in the mirror differs indeed so much from the organ as dissected after death that although familiarity with its anatomy is necessary for various purposes, the appearance presented during life is of far greater importance. It is, then, with the laryngeal image we are just now concerned. The theory of the formation of this image has already been explained, and the chief difficulties that may arise in the attempt to examine it have been pointed out. The learner, therefore, who has digested what has pre-



ceded is prepared to check by his own experience the description that follows. However confident he may be in his powers of manipulation and his complete comprehension of the subject, the student will scarcely expect easily to bring into view all the parts of the larynx in every case. His experience will, in fact, be made up of different views, which he mentally unites into one. It is, however, very desirable, especially at first, that he should be able thoroughly to impress on his mind tolerably complete views of the larynx. For this purpose he should, if possible, get a competent teacher to select for him a patient with a well developed larynx, and who is accustomed to the inspection. In this way he will be able to study more leisurely and more thoroughly the healthy larynx than if he begin to examine patients indiscriminately. In some of them he would see but little, and in others possibly nothing at all. To assist him in this practical study I furnish engravings of the healthy laryngeal image. These I have had drawn on an enlarged scale in the hope of rendering the explanations more distinct.

In the first (Fig. 32) the vocal cords are open as during inspiration, in the second (Fig. 33) they have approximated in preparation for vocalisation — this being the position in which they can most easily be observed. (Compare with this the form of the open larynx in Plate II. Fig. 2.) It will be remembered that during inspiration and expiration they will be seen to alternately approach and recede from each other. They are, as previously stated, the most prominent objects after the epiglottis, and, once seen, these two white bands in motion, stretching from the back to the front of the larynx, can never be forgotten.





there is in the middle of the upper edge a depression curved out. In other cases this part rises more prominently—sometimes almost to a point giving a triangular appearance to the valve. In other persons the curve is preserved, but it rises so much and the sides are so much approximated that it has been compared to the Greek letter  $\Omega$  (Omega). Not only its actual shape, but its position varies, so that different views appear in the mirror—in one case only its free edge, in another the whole under surface, and in a third the border and part of the upper surface. The beginner must not, therefore, expect always to find the leaf-like body he has read of in his text-book of anatomy. What may be called a fairly-formed natural shape has been shown in preceding figures, others will be noticed on reference to Plates I and II, but there is no more reason why the epiglottis should be uniform than that noses should be alike.

The free border of the epiglottis will be seen to alternately rise and fall during the examination. The attached border is connected with the receding angle between the two alæ of the thyroid cartilage by a long narrow band, the *thyro-epiglottic* ligament, and a similar band, the *hyo-epiglottic* ligament, connects it with the posterior surface of the body of the hyoid bone. The *lingual, under or anterior surface* of the epiglottis usually curves forwards towards the tongue, and the mucous membrane by which it is covered forms a median and two lateral folds called *glosso-epiglottidean* ligaments (Fig. 32). The *posterior, inferior, or laryngeal* surface curves in a reverse way. It is usually convex from above downwards, and concave from side to side.

To the sides are attached the *glosso-epiglottidean* folds or ligaments (Fig. 32, *g.-ep.*).

The epiglottis, although the most prominent part of the image, is thus necessarily not all visible at once. Moreover, in perhaps only a few cases can even a skilled laryngoscopist easily demonstrate the whole. In most cases a part of the upper surface comes into view on each side, presenting almost a scroll-like form, and in the middle we see the under surface turned up like a lip. Below and behind this another portion seems to bulge out, and has been distinguished as the cushion (Fig. 32). The tinge of colour varies with the part seen. The upper surface is of an obscure pink; the mucous membrane here is rather lax compared with the opposite surface, and vessels ramifying over it may often be observed. The lip looks like what it is, yellow cartilage with a vascular mucous membrane clothing it, and giving a tinge of pink or red. The cushion or tubercle is much brighter. Further, when we see the whole of the laryngeal surface of the epiglottis at once, the colour is more distinct, and this hue has been taken for congestion by beginners, an error more likely to occur if some small vessels should be discerned coursing over the surface. If only the edge appear in the mirror it looks, from the reflection of the light, like a pale or white line.

The glosso-epiglottic ligaments have been already shown in the Fig. 22 (p. 32), and again in Fig. 25 (p. 51), as also have the outer surface of the arytæno-epiglottidean folds and the inner surface of the wall of the pharynx.

After the cords, the next most striking objects in the



view are the prominences composed of the arytænoïd cartilages surmounted by the cornicula laryngis. These arytænoïd cartilages are so called from the resemblance they bear, when they are approximated, to the mouth of a cup or ladle (*ἀρύταινα*, another form for *ἀρυτήρ*, a word applied to any small vessel for holding water). Their situation is at the back of the larynx at the upper border of the cricoid cartilage, one on each side. They are therefore right and left; the form of each is somewhat pyramidal. The apex of each pyramid is pointed and curved backwards and inwards. Each apex is also surmounted by a small conical nodule called the corniculum laryngis or cartilage of Santorini (S, Fig. 32), to which is attached the arytæno-epiglottidean fold. These parts are more prominent when the vocal cords are closed (Fig. 33), and to examine them the patient should be made to emit a vowel sound—eh, ah, &c. The mucous membrane is here of a redder hue than in the other portions of the larynx.

In the fold of mucous membrane extending from these bodies to the sides of the epiglottis already spoken of as the arytæno-epiglottidean folds, at the junction of the posterior with the middle thirds, we observe two other elevations called the cuneiform cartilages or cartilages of Wrisberg (W). They are seen in both the open and closed larynx in front of the prominences just described. The cartilages of Wrisberg vary somewhat in their appearances. Occasionally they seem triangular in shape, their apices pointing outwards; more frequently they appear nearly round. It is obvious that the variations partly



depend upon the amount of submucous aerolar tissue around them, and partly on the breadth of the folds in which they are located. There are also great differences in the degree to which these cuneiform cartilages are developed. Sometimes they are quite invisible, while occasionally another distinct elevation can be made out between them and the cornicula. These are probably caused by small additional cartilages. The folds in which these prominences appear, aryæno-epiglottidean folds, sometimes contracted to aryæno-epiglottic and even ary-epiglottic, bound the superior opening of the larynx, and can easily be observed in the mirror, extending from the aryænoid bodies upwards to the sides of the epiglottis. They are usually paler in colour than the prominences mentioned.

Between the aryænoid bodies there is a fold of mucous membrane, the prominence of which depends on the position of the cords. When they are wide open it is very apparent, but when they are closed it folds together. This is called the inter-aryænoid fold, or the posterior commissure (Figs. 32 and 33), and forms posteriorly the superior boundary of the larynx.

To the outer side of each aryæno-epiglottidean fold is a sort of recess which usually contains a quantity of frothy secretion, and where particles of food sometimes accumulate. From its shape this recess is sometimes called the pyriform sinus, and as in it the corner of the hyoid bone may often be seen shining through the membrane, it has also been termed the hyoid fossa. The two recesses unite behind the aryænoid cartilages, and so pass into the œsophagus.

Below the arytaeno-epiglottic folds (ary-ep., Figs. 32 and 33) two others may be distinguished. These have been called by anatomists the superior or *false* vocal cords, because in the normal condition they do not assist in the formation of the voice. Other names have been proposed for them. Some anatomists speak of them as the superior ligaments of the larynx, but this is not appropriate, for although a narrow fibrous band is enclosed in each, that has been distinguished as the superior thyro-arytænoid ligament. Another name proposed is ventricular bands (Mackenzie), and a third longer one, regulators of the glottis (Gibb). Names perhaps are of little importance, and we may speak of them by either; but to call them the superior ligaments implies that the true cords are the inferior ligaments of the larynx, a name for which no plea can well be put in.

The false cords are thickish and their colour is rather deeper than the folds above them, so that they form sufficiently prominent points in the image, and should always be examined, as they are often the seat of disease. Each false cord is attached anteriorly to the angle of the thyroid cartilage, near the junction with the epiglottis; and posteriorly to the fovea triangularis of the arytaenoid cartilage. They are thus close to each other in front, but diverge behind, leaving an irregularly triangular opening between them called the false glottis. They do not, however, pass backwards in a direct line, but sweep round an ellipse, so that their free edges are crescentic in shape. This form, however, is lost when they are approximated closely, as they are during deglutition and on some other occa-

sions. Then they are shortened by the action of their muscles, and brought together until they meet, completely shutting off the superior laryngeal space from the general cavity of the larynx. Their lower edge borders the ventricle, and looks a little paler from the light being fully reflected from it. On the vocal cords coming together there may sometimes be noticed just below the cushion of the epiglottis a little depression, between the two sets of folds described, called by Merkel the *fovea centralis*.

We have mentioned the ventricles, or, as they are also sometimes called, the ventricles of Morgagni, or the sinuses of the larynx. These are only the spaces between the true and false cords. Each ventricle is described by anatomists as an oblong fossa, bounded above by the free crescentic edge of the false vocal cord; below by the straight edge of the true cord; externally by the thyro-arytænoideus muscle. The anterior part of the ventricle leads to a *ul-de-sac* of mucous membrane between the false cord and the inner surface of the thyroid cartilage, sometimes reaching as high as its upper border. This recess or pouch, conical in form, and about half-an-inch deep, has been compared to a Phrygian cap, and is named the *sacculus laryngis*. Its mucous surface is studded with the openings of sixty or seventy follicular glands which lie in the areolar tissue beneath. The pouch is covered with a fibrinous envelope, and this by muscles, which according to Hilton (a) compress the *sacculus*, and so discharge its secretion on the vocal cords,

(a) "Guy's Hospital Reports," vol. v.



which are thus lubricated. The openings of the ventricles are only sometimes seen, and then they appear merely as dark lines of variable length and breadth. They are most easily seen in thin people.

The inferior or *true vocal cords* (*chordæ vocales*) have already been mentioned, but their importance entitles them to further description. They are the most striking parts of the laryngeal image, the chief landmarks in the fields under exploration. As they alternately approach and recede from each other their movements tend to fix attention upon them. During very quiet respiration they may seem to almost cease moving, taking up the position of rest which is about midway between the median line and the walls of the larynx. On a fuller inspiration they separate widely posteriorly, but to a less degree at the anterior commissure. Sometimes with a very deep inspiration they are withdrawn so closely to the sides of the larynx as almost to disappear, leaving a nearly straight tube continuous into the trachea. During expiration they again return towards the median line, where they meet in vocalisation. Consequently, to see the trachea, or to obtain a good view of the posterior wall of the larynx, we take advantage of the period of inspiration, but when we wish to examine the cords themselves, we direct the patient to emit a vowel sound—an act which brings them parallel to each other in the median line, where they close the glottis and bound the view in the downward direction, forming, so to say, the bottom or floor of the laryngeal cavity. This boundary, in consequence of the attachments of the cords, is on a level with the bases of the arytaenoid cartilages. In



this position the entire extent of their upper surfaces is exposed to view, and if a prolonged note be uttered we may watch the vibrations of the tense cords on which the sound depends. Inasmuch, however, as the *false* cords are situated above the true ones, and are also sometimes brought together in a similar manner, it is obvious that in such case the former will more or less completely hide the latter. In fact, the approximation of either pair of cords diminishes the extent of surface visible beneath them. As, therefore, the upper or false cords advance towards the median line, the lower or true look narrower and narrower until on complete closure, in common with the rest of the general laryngeal cavity, they are shut out from view. This occurs both in physiological movements and as the result of pathological changes.

Each true vocal cord is about seven lines long in the male and five in the female. The white colour depends on the extreme thinness of the mucous membrane and the fineness of the capillaries. On the cords the epithelium is of the pavement variety, while in the rest of the cavity it is ciliated, except just at the pharyngeal orifice, where the pavement epithelium turns in a little from the pharynx. Each true cord is attached in front to a depression at the angle of the thyroid (*θυρεός*, a shield; *εἶδος*, form) cartilage about half way down below the notch, and instead of sweeping round in a curve like the false cords, they pass directly backwards to be inserted into the prominences called the vocal processes at the anterior angles of the bases of the arytenoid cartilages. Their edges are consequently straight—not semi-lunar. These strong fibrous bands

are constituted of fine elastic tissue, formed by the upper free edges of the crico-thyroid membrane, and intimately connected with the thyro-arytænoid muscles on their external side.

The vocal process (processus vocalis) may easily be distinguished as a yellow spot caused by the colour of the fibro-cartilage shining through the membrane. Sometimes a similar spot, caused by a nodule of cartilage being present, may in like manner be observed near the anterior commissure. At this angle we may also sometimes discern a rather irregularly disposed fold of mucous membrane, which has been mistaken for an abnormality. So, too, we may get a glimpse of a narrow fold of mucous membrane running along immediately below the vocal cords parallel to their free edges, and this must not be mistaken for disease.

The glottis (γλωττα, Attic for γλώσσα, a tongue) is the opening or interval between the true vocal cords, to which also the hybrid phrase *rima glottidis* is often applied, as well as the English term chink or fissure of the glottis. The true glottis is the narrowest part of the larynx. The name appears originally to have been applied to the boundaries of the opening, and Mandl has recently proved that Galen so used it, considering that the cords resembled the little tongues or reeds of some wind instruments. Some forms of ancient Greek flute, αὐλός, appear to have had two such tongues. But whatever the etymology, the word *glottis* has for centuries been used to denote the opening between the cords. This opening, which is alternately dilated and contracted by the movements of the cords just described, extends from the angle of the thyroid car-

tilage in front to the extreme posterior wall of the larynx behind. Thus its lateral boundaries comprise not only the cords which form its anterior two-thirds, but the smooth inner surface of the arytaenoid cartilages which form the posterior third. The former part is called the inter-ligamentous, and the latter the inter-cartilaginous portion. The former used to be called vocal and the latter respiratory, but the distinction was founded on an error, and is therefore no longer of value. The length of the opening is in the male nearly an inch (less a line). At the base *when dilated*, it measures about a third of its length. In the female the measurements are less by two or three lines. The glottis is usually said to be triangular in shape, and in a state of repose it forms an isosceles triangle. When it is fully dilated the posterior third is opened by the arytaenoid cartilages being drawn apart, and the form of the opening has been called lozenge-shaped (Fig. 32). During this state of dilatation the posterior wall of the larynx is seen to the best advantage. In this part the mucous membrane is loose and displays longitudinal folds, even when the cords are widest apart. A number of glands are here aggregated, and this part is often the seat of disease.

So much for the several parts of the laryngeal cavity, but we can see farther still with our mirrors. When the glottis is open it is very common to see some of the rings of the trachea showing through their mucous membrane with great distinctness. This membrane is generally paler than that of the larynx, but this may partly depend on its being less brilliantly illuminated. The rings of the trachea from the reflection of the light



often look quite white. Another point we may also bring into view is the cricoid (κρίκος, a ring, εἶδος) cartilage (Fig. 32). Sometimes we can also see the openings of the bronchi (Plate II., Fig. 2).

It is hoped that by the aid of the engravings these descriptions will be made sufficiently clear, and that the student will find no difficulty in reference to the shape of every part of the healthy larynx. It may be repeated that there are considerable differences of shape within the range of health, and this fact is particularly observable in reference to the epiglottis, though the arytenoids, the commissure, and other parts vary considerably.

The normal form of the several parts of the laryngeal image having been thoroughly impressed on the student's memory, he is able to pass to a consideration of the deviations to be met with in disease. Such deviations may obviously be caused in various ways. For instance, there may be loss of substance, which is frequently caused by ulceration. Or there may be swelling of some parts, causing a remarkable change of conformation. Again, there may be new growths. From the changes of form thus produced we are often able to pronounce at once our opinion of a case. At the same time there are other circumstances which should always be taken into account in estimating the diagnosis and prognosis of a case. Here it is only proposed to specify some examples of the deviations of form commonly met with.

I have already illustrated by engravings the fact that the epiglottis varies much in shape, without its variations being the result of disease. Sometimes,



however, it is swollen, and completely altered in shape, and this change constitutes an important element in the case. Again, the edge of the lip may become notched like a saw, as the effect of ulceration ; or there may be scarcely any of it left, so much loss of substance having occurred from this process. In such cases there is usually deep ulceration elsewhere, with great loss of substance.

Partial swelling is the next mode in which changes of shape are produced. Sometimes there is such enlargement as to quite obliterate the distinctions between the cartilages of Wrisberg, the arytænoids, and the cornicula. This condition is one very commonly met with at a certain stage of phthisis.

It is not necessary to dwell further on the various enlargements now, as I shall have occasion to describe them in further detail. Suffice it to say, that every deviation of shape, whether the result of loss of substance from ulceration, of swelling from inflammation or infiltration, or of the development of a new growth, is of the very highest importance, and should not be unnoticed.

Changes of colour are as significant as those of form, and will be studied further on by the aid of the plates.

#### TRACHEOSCOPY OR INFRA-GLOTTIC LARYNGOSCOPY.

We have already shown that it is often possible to distinguish the rings of the trachea, &c., in the faucial mirror. It is not to this, however, that the term tracheoscopy has been applied, but to the exploration

of the trachea by means of a small mirror introduced into it through the wound, after a patient has for any purpose undergone the operation of tracheotomy. Neudörfer seems first to have proposed thus to make use of the wound when tracheotomy had been necessitated. Several cases have now been recorded in which the method has been used to examine the trachea and the under surface of the vocal cords. This surface being obviously invisible in ordinary laryngoscopy, it has been proposed to call the plan *infra-glottic laryngoscopy*. Common tracheotomy tubes are not adapted for the purpose, but one must be obtained with a long fenestrum. Türk employed a special tube in the trachea for the purpose. A very small mirror is necessary, a steel one is to be preferred as no room is lost by a rim. The most remarkable difference discovered by this method is, that the under surface of the cords instead of being white like the upper, is of the same red hue as the surrounding mucous membrane. We must remember that in these cases there are mostly changes caused by the disease for which the operation has been performed, besides which the operation itself may have left its trace.

Semeleder has recorded the case of a medical man who had had tracheotomy performed and was able to practise this method on himself. He suggested a number of improvements in the apparatus, as well as in the canula he was for a long time obliged to wear.

#### LARYNGOSTROBOSCOPY

Is a term applied by Oertel to a method of studying

the vibrations of the vocal cords during vocalisation by means of a powerful light rapidly interrupted. The most convenient means of interruption is a revolving perforated diaphragm, which must be placed between the light and the faucial mirror. It is expected that the rapidity of the vibrations of the cords in uttering various tones may thus be determined.

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## VII.

### AUTO-LARYNGOSCOPY.

Demonstration. Various Modes—with Patients, with Drawings, with Models. Auto-Laryngoscopy : Plans of examining and exhibiting one's own Larynx.

To teach the art of laryngoscopy the professor may employ various methods—some of which are within the reach of every pupil, and will serve for self-tuition and practice.

Unquestionably, the most efficient, as well as the most interesting plan of instruction, is to demonstrate upon living persons the natural form and colour of the various parts reflected in the laryngoscope, and already described, and to follow this by a series of demonstrations upon patients of the various diseases affecting these parts. For this purpose, however, the professor requires a large clinique, and undoubtedly the student who can avail himself of such instruction will make much more rapid progress than those not within its reach. Still no one need despair. It is quite possible to acquire the art without an extensive clinique, though it must be much more slowly. The mere manipulation of the instruments will be readily



acquired by any one from careful study of what has preceded, though it is much easier to learn from seeing them used.

As only "practice makes perfect," the pupil will naturally feel diffident in his early attempts to examine a patient for himself. In a large clinique he will find a number of patients who are thoroughly accustomed to the contact of instruments with the throat, and who display the laryngeal image to its full extent without effort. The physician will naturally assign such cases to beginners, who consequently become familiar with the appearances we have already described, and being told the nature of the cases, do not fall into the errors they otherwise might. They have, therefore, nothing to unlearn.

The beginner may obtain a fair view by looking over the shoulder of the teacher while he is examining a patient for the purpose of diagnosis, and this is the best way to commence the study. It has been objected that the two observers do not see at the same moment exactly the same point, and we may admit that there is some force in the statement, but it is to be remembered that the part to be brought into view is not a mere point, but the image reflected in the whole surface of the mirror—an inch or more in diameter. As a matter of fact, we demonstrate daily in this manner not only the vocal cords in action, but diseases confined to small portions of the larynx, the diagnosis of which is often rendered distinct to those who have never previously seen the laryngoscope in use. A few lessons of this description will therefore save beginners much weary work in uncertainty,

besides giving them sufficient confidence to begin to examine patients for themselves, which is the next object to be accomplished. At the Hospital for Diseases of the Throat there is every opportunity of thus learning laryngoscopy, and ample material for studying the practical applications of the art to the diagnosis and treatment of disease.

In the absence of such opportunities of practical instruction the learner will do well to set himself to work with drawings and models, then to practise auto-laryngoscopy, and afterwards to examine with the laryngoscope such of his friends as may be willing to permit it. These plans may be separately discussed. As to drawings, it has been shown in speaking of the theory of laryngoscopy, that the anterior part of the larynx appears at the upper part of the image on the mirror; while the posterior commissure is at the base, the former thus seeming the nearer, and the latter the more distant from the observer. This, which is the only inversion that really takes place, can be demonstrated by an ordinary toilet mirror inclined at a suitable angle, or what is still better, a laryngoscopic mirror may be used. For this purpose any of the laryngeal images engraved in these pages will suffice. After this the plates may be studied in the same manner, and a well-made wax model of the larynx may be procured and practised upon in the same way.

Another step may be taken when either drawings or models are used, and it is particularly desirable in the latter case. It is for the student, having accustomed himself to see the parts in an ordinary laryn-

geal mirror by diffused daylight, to darken his room, and to practise with artificial light, just as if his model were a living patient. He may thus become completely master of his light, able to throw it on any point with the utmost facility, while he is learning the usual appearances of the laryngeal image. And he should remember that dexterity is of the first importance in laryngoscopy. Let him also thus practise holding the mirror with each hand, for he must aim at being ambi-dexter. Anatomical specimens may be carefully examined in the same way, and in all positions, and should these not be accessible, the larynx and trachea of a sheep, calf, or other animal can always be obtained from the butcher. The anatomy of these parts should be read up at the same time.

All these plans are, however, only preliminary, and the pupil must eventually proceed to examine the living human larynx. He should not trespass upon the good nature of his friends until he has perfect command of his instruments, and is able to feel sure he will not produce any unpleasant tickling. By a little variation in the arrangement of his apparatus he may look at his own larynx in a looking-glass. This practice has been dignified by a distinct name—Auto-laryngoscopy. He should become quite *au fait* at it, and we therefore proceed to consider it at length.

*Auto-laryngoscopy* (αὐτός, λάρυγξ, σκοπέω,) is the art of examining one's own larynx. The pupil should practise it for the sake of acquiring facility in the use of instruments, and also as the best way of studying the anatomy and physiology of the larynx. The movements brought about in breathing, in sighing,



in vocalising, in coughing, in retching, in swallowing, can all be best observed on oneself. Moreover, he who has acquired complete control over his pharyngeal and laryngeal muscles can always demonstrate to others some of the most important facts brought to light by the laryngoscope. There are other reasons why the pupil should aim at being a good auto-laryngoscopist, and we shall therefore proceed to describe the various plans of examining one's own larynx.



FIG. 34.

The simplest method of all, when sunlight is available, is to sit with the back to the light, so as to get the rays to fall directly upon a small mirror held in one hand, while with the other, one of my rectangular faucial mirrors is introduced. The engraving (Fig 34) shows this plan, which was adopted by Garcia,



the first person who carried out the idea of studying the movements of the voice in action. (a) Artificial light may be employed in a similar manner.

Another simple mode of illuminating the pharynx was suggested by Czermak, who placed a lamp as near as possible to the open mouth, and so held a small hand-mirror as to protect his eyes from the lamp, and permit him to see in it the image of the glottis reflected from the faucial mirror held in the other hand.

The pharyngoscope of M. Moura-Bourouillou (b) may be advantageously substituted for the simple lamp. In this instrument the rays of light pass through a perforation in the reflector, and fall directly on the faucial mirror. This instrument is also useful for other purposes. Those who employ my upright stand (Fig. 15) as a support for the reflector, have only to supplement it with a common hand mirror to obtain the most convenient apparatus for auto-laryngoscopy by reflected light. Seated in the chair, which in simple laryngoscopy is occupied by the patient, the operator finds the lamp by his side, while nearly opposite to him is the reflector. From this the rays of light fall upon his face, and with the hand-mirror as a guide, opening his mouth, he easily takes the exact position to bring them to a focus in the fauces, where, with the disengaged hand, he holds the laryngoscope. Another person looking through the perforation in the reflector sees the

(a) Proceedings of the Royal Society, 1855.

(b) "Cours complet de Laryngoscopie." Paris, 1861.

laryngeal image. Indeed, two or three can see it looking at the side of the reflector, and another person or two standing behind the operator can see the image at which he is looking in the hand-mirror.

An ordinary moderator lamp, with the reflector on stand, a faucial mirror, and a hand-glass, thus furnish a simple and effective apparatus for auto-laryngoscopy and demonstration on any convenient table.

This plan is so easy that I have heard of no difficulties. The engraving (Fig. 35) taken from a photograph, shows a demonstration to one person. It is obvious enough that others could also see, but it would be tiresome to photograph several, and the



FIG. 35.

engraver has merely followed the original. On the lamp depicted a condensing lens is fixed, which, of course, increases the brilliancy of the light, as already explained.

It may be thought by some that it is fatiguing to hold the hand-mirror steady. For prolonged demonstrations a little mirror can be supported on a jointed rod coming from the stem of the stand. The beginner will, however, not regret the slight fatigue of a little practice by my method, when he finds it gives steadiness to his hands, and thus furnishes one of the best exercises in the manipulations he will have to practise. He should therefore hold the looking-glass alternately with the right and left hand, in order to acquire dexterity with each.

It has already been stated that Dr. Walker's globe condenser is furnished with a small plane mirror which makes it available for demonstration. In fact, the addition of a small plane mirror to any apparatus is all that is required.

Dr. George Johnson has proposed another method, which also has the merit of simplicity, but the image is perhaps not quite so sharply defined, as the light which falls on the faucial mirror is reflected from a plane mirror in front of the operator instead of coming directly from the reflector.

His plan is to sit at a table of a convenient height, on which a looking-glass is placed at a distance of about eighteen inches in front, and a moderator or a gas lamp on one side of the glass, but two or three inches further back, so that the light may not pass directly from the lamp to the mirror. Then, with the



reflector on the forehead, the light is directed on to the image of the open mouth in the looking-glass; then, introducing the laryngeal mirror into the mouth, the reflection of the larynx appears in the glass, and any one looking over the head or shoulder can see the image at the same time. This method, therefore, serves for auto-laryngoscopy and for demonstration; in other words, the experimenter can, by this means, see his own larynx and show it to others.

In practising this method of auto-laryngoscopy, one eye is shaded by the lower margin of the reflector on the forehead, and the other by one or two fingers placed at the edge of the reflector, which they serve to move when the direction of the light has to be changed.

The only other method that need be mentioned here is that of Professor Czermak, which is well adapted for prolonged demonstrations. It requires, however, a special apparatus, and this has been improved by Weiss. It consists of a concave and plane mirror supported on independent stems about a foot apart, in a manner to permit of motion in all directions, so that each mirror may be easily fixed at the necessary height and at any angle. The demonstrator sits before the plane mirror, into which he gazes. The concave mirror is about a foot further off, and so placed as to reflect the rays from the lamp into the mouth. The image in the laryngeal mirror can be seen by any one looking through or beside the reflector, and the image at which the demonstrator himself is looking in the plane glass can be seen behind him.

The theory of auto-laryngoscopy is, of course, the



same as that of examining the larynx of another, and the practice consists in mere modifications of the position of the persons and the apparatus. The engraving (Fig. 36) may render the subject a little



FIG. 36.

1 to 6, the cervical vertebræ ; *u*, uvula ; *L*, larynx ; *e*, epiglottis ; *tr*, trachea ; *h*, hyoid bone ; *t*, tongue ; *J* (lower), jaw ; *m* (upper), maxilla ; *k*, laryngoscope.

clearer. The laryngoscope being held *in situ*, a ray of light, represented as a straight line (*a*), is seen to fall upon it, and be reflected behind the epiglottis (*e*), and so down the larynx (*L*), impinging on the wall of the trachea (*tr*), when an image appears in the faucial mirror (*k*).

## VIII.

### RHINOSCOPY.

Exploration of Posterior Nares by Reflected Light, or Rhinoscopy. Early Efforts in this Direction. Theory and Practice of Rhinoscopy. Angle of Rhinoscope. Difficulties and Means of Overcoming them; Narrowness of Faucial Aperture, Sensibility, Adhesions, Respiration, Vocalisation, Palate Hooks, Ligatures, &c. Position of Patient and Physician. The Rhinoscopic Image, its Parts in Health and Disease. Anterior Rhinoscopy. Auto-Rhinoscopy. Pharyngoscopy and Oesophagoscopy. The Palate-Myograph.

IF the faucial mirror be held with its reflecting surface turned upwards, we may obtain a view of the posterior nares. It is this slight deviation from the ordinary procedure that has received the name of rhinoscopy (ῥίιν and ῥίς, the nose, σκοπέω).

It is not at all surprising that from an early date attempts had been made to see these parts by the aid of mirrors, and Levret, Baumés, Bozzini, and other pioneers in the art, appear to have considered it easier to explore the nares than the larynx. In the early days of laryngoscopy, Czermak took up this as a distinct branch of the subject, and the modern practice of rhinoscopy is usually said to date from the

appearance of his paper (a). Semeleder, Voltolini, Stoerk, and others, soon took up the investigation, and their productions are well known to all who have investigated the subject.

The theory involved in the practice of rhinoscopy is exactly the same as that which has already been expounded as regulating laryngoscopy; the only difference being that the mirror is so held as to reflect the light into another cavity, of which accordingly an image is obtained. There are, however, some variations in practice, and inasmuch as the art of rhinoscopy is more difficult to acquire than that of laryngoscopy, it may be well to set them forth in detail.

In the first place, to explore the posterior nares, it is desirable to select a small mirror—one half an inch in diameter will always be found large enough—and it is convenient to have the stem curved a little upwards, corresponding with the arch of the tongue. Most writers direct the rhinoscopic mirror to be fixed to the stem at a right angle, but this is not essential, for, as already stated, a view of the posterior nares may be obtained by simply turning upwards the face of the ordinary laryngeal mirror. As a rule, it may be found to facilitate the examination to have the angle a little less obtuse than usual for laryngoscopy, but the stem of the mirror may at any time be somewhat bent, in order to change the angle slightly. It is, however, not desirable for the beginner to indulge

(a) Ueber die Inspektion des Cavum Pharyngo-nasale und den Nasenhöhle vermittelst kleiner Spiegel.—*Wien, Med. Woch.*, Aug. 9, 1859.



too much in this practice, as it is apt to render him more ready to blame the shape of his instrument than his own deficient patience. Very great variations are to be obtained by depressing or raising the stem of the mirror. By sufficiently depressing the handle, the face may be made to assume a vertical position, while raising the handle makes it more and more oblique.

Although as long ago as 1860, in the first edition of my treatise on "Sore Throat," I spoke of rhinoscopy as merely turning upwards the face of the ordinary laryngeal mirror, most authors continued to assert the necessity of having the rhinoscope fixed at a right angle to its stem. Dr. Solis Cohen, however, not only adopted my view, but maintained the superiority of the ordinary laryngoscope for exploring the posterior nares. The beginner will probably conclude from this that, as in so many other departments, he must expect success rather from his skill in managing his instruments than from the possession of a great variety.

Having selected his mirror, the observer takes his position opposite to the patient, as for laryngoscopy. The greater the space between the posterior wall of the pharynx and the velum the easier it will be to illuminate the nares. When this space is unusually narrow it may be almost impossible to obtain a view of the parts.

The first glance in the mouth not unfrequently reveals the soft palate closely applied to the pharynx instead of hanging freely so as to permit us to pass the mirror behind it. This is caused by the patient breathing through the mouth. He must, therefore, be



told to breathe through the nose, when the soft palate falls forwards. Some patients evince great difficulty in maintaining nasal respiration when the mouth is open, but they may acquire the habit. They may be requested to emit nasal sounds, as suggested by Czermak, or to take a series of short, rapid respirations, as advised by Türk. At the moment that the current of air is thus sent through the nostrils we may obtain a glimpse of the rhinoscopic image, but it is often impracticable to obtain a satisfactory view until the patient has been carefully and patiently trained. In obstinate cases the soft palate may be mechanically separated from the pharynx during the examination. For this purpose variously shaped palate-hooks have been made, but they are not often of much use, for they generally give rise to spasm of the muscles, and thus defeat their object. If used at all, the simplest are the best. A broad, flat, or fenestrated hook, held in the left hand, so as just to support the uvula, is the most likely to be tolerated, but it is only by repeated contact that the muscles of the soft palate lose their irritability to such an extent as to make it of real service. The time and patience expended on this will usually suffice to train the patient to bear the examination without the hook. In extreme cases, and for operative purposes, a ligature has been passed round the uvula to hold it out of the way. The palate has also been held forward by a couple of tapes passed backwards through the nostrils, brought out of the mouth, and secured by lying in front of the upper lip.

For ordinary diagnostic purposes the most unpromising patient may be taught to tolerate the exami-

nation, and in a large proportion of cases even the tongue-depressor may eventually be discarded. In most cases, however, some mode of controlling the tongue will be indispensable—at any rate, at first—and my tongue-depressor will be found the most simple and effectual instrument. (Figs. 18 and 20.) Occasionally we may obtain a view with the patient's tongue held out as in laryngoscopy. Often in trying to assist, the patient only makes difficulties, since, the position of rest is that in which we want the velum. This is perhaps why singers with complete command over certain movements and with intelligence and desire to co-operate, are often more difficult to examine than the ignorant boor, who stolidly opens his mouth and cares no more about the matter.

Combinations of mirrors and tongue-depressors have been constructed, but will generally be found hindrances; for they really confine the movements of the mirror. The patient can himself easily employ my tongue-depressor, and thus the physician has both his hands free for manipulation.

It only remains to speak of the position of the patient, from which much assistance may be obtained. In speaking of the difficulties of laryngoscopy I pointed out that some of them could be removed by varying the relative position of physician and patient. In rhinoscopy this point is of greater moment. The lamp and other apparatus is managed just as in laryngoscopy, and it is obvious that the variations of position necessitate a little intelligent adaptation of our instruments. The mirror has to be held in such a position as to illuminate the posterior nares. The

rays of light, therefore, must fall upon the mirror in such a manner that they may be reflected upon the parts of which the image is to be seen on its surface. The plane of this surface will form with the plane of the horizon an angle of about 130 degrees. To illuminate the mirror held in that position it will be found that the reflector has to direct the rays to a point lower in the fauces than in the practice of laryngoscopy. Hence some advise that the patient should occupy a somewhat lower seat than the physician, and this will frequently be found of great assistance. It is also desirable that the patient should sit quite upright. Indeed, as mentioned by Moura-Bourouillou, he may incline the head slightly forwards, so as to let the uvula fall in the same direction. Some observers however, advise the patient to be seated on a higher level than the physician, and to incline the head slightly backwards. As a rule, I adopt the erect posture, which is also recommended by Semeieder. In this position a slight inclination can be at once given in either direction. The variety of recommendations only illustrates the fact that a view of the nares may be obtained without an exact adherence to either. The position of the parties in the simplest method of rhinoscopy is seen in Fig. 37.

Few things are more surprising to beginners than the appearance of the rhinoscopic image, which does not in the least resemble that revealed in laryngoscopy, and differs materially from the more common preconceptions respecting it. The parts to which attention is now being directed are not often examined in the dissecting-room, and in ordinary autopsies are never



disturbed. This is no doubt the reason why many students have not a very accurate idea of the conformation of the parts, but even those who have carefully worked up the anatomy of this region are often not a little surprised at the image they first see in the rhinoscope.



FIG. 37.

Again, what is called the rhinoscopic image is really the combination of several views, each of which is separately examined by the observer. The mirror is held first on one side and then on the other. In each case it is moved more freely than in laryngoscopy, so as to examine as wide a field as possible and then the



two halves—each composed of the several views thus obtained—are blended into one in the observer's mind. It is easy, therefore, to understand that exactness is only to be attained by the utmost care, and all the observer's knowledge and attention are required to appreciate the various views revealed in rhinoscopy, and deduce from them correct indications. At the same time, though this is the most common mode of proceeding, there are cases in which a view of a considerable portion of each half may be obtained in the same image.

As it is absolutely necessary for the pupil to thoroughly familiarise himself with the chief points of the rhinoscopic image and to form a fair idea of that image as a whole, he should not only carefully study the diagram (Fig. 38) which shows the position of the



Fig. 38.

*a* Posterior border of the septum nasi ; *b*, middle turbinated bone ; *c*, inferior turbinated bone ; *d*, orifice of the Eustachian tubes ; *e*, superior turbinated bone ; *f*, spatula ; *g*, soft palate.

parts and their relations to each other, but before proceeding to the examination of patients thoroughly master all the details of the image as depicted in Plates iv. and v.

The point which should first be sought is the *septum nasi* (*a*) which divides the rhinoscopic image into two halves, and one surface of which should be clearly made out on each side. It forms a shining central ridge, narrow below, but increasing in breadth above. At its lowest narrow part, if well illuminated, it may look quite white and bright from the bone shining through the thin mucous membrane. If the light be less brilliant or the membrane not quite so thin and tense, the hue may be pale pinkish, or there may be a yellowish tinge. The colour becomes deeper as the septum extends upwards, until at the highest, broadest part it is lost in the red of the mucous membrane of the surrounding parts. It may be added that the septum nasi seldom occupies the exact centre of the image, but leans a little to one side or other, so that we rarely see a rhinoscopic image precisely symmetrical.

Having examined the septum, the next point is to make out the *middle* turbinated bones (*b*). They are easily found, being very prominent points occupying a large portion of the image on each side of the *septum*. They are covered with thin mucous membrane of a pale pinkish hue, and have been mistaken by beginners for nasal polypi. Just below, and much resembling them, at the base of the *fossæ nasi*, are two other, somewhat smaller roundish projections, looking like a pair of almost solid tumours. These are the *inferior turbinated bones* (*c*). They do not seem to approach so near to the *septum* as the middle ones, and moreover look more solid and duller in colour, no doubt partly due to their being less brilliantly illuminated.

Just outside and behind the inferior turbinated

bone we may easily discern the irregular, trumpet-shaped opening of the Eustachian tube (*d*), the large size of which often surprises the beginner. Indeed, many find it easier to look for the Eustachian orifice first, and from that to trace the other parts. These openings, which are large enough to admit the little finger, look downwards and outwards, and are often rendered more conspicuous by the parts below them being of a yellowish colour. From their lower edge running downwards and inwards there is a prominent ridge formed by the levator palati, while from their upper ridge starts the fossa of Rosenmüller, which extends upwards and inwards, and in which the Eustachian catheter may get lodged.

The *superior turbinated bones* (*e*) may be mentioned next. They are not nearly so easy to find with the mirror, in which they are usually reflected only as narrow projections, in shape almost like a triangle, with its apex pointing downwards and inwards, and perhaps somewhat backwards.

We have yet to mention the three passages between the turbinated bones. The superior meatus is the largest, but the easiest to discover is the middle one which appears towards the outer wall of the fossa. The inferior meatus is very indistinct, often appearing only as a dark line, and to the beginner seldom visible.

Below the nasal fossæ it is easy to make out the posterior surface of the uvula, velum, and pillars of the fauces, &c. Above is the vault or roof of the pharynx, but this appears posteriorly in the rhinoscopic image, and being seen in perspective, is consi-



derably foreshortened. The mucous membrane here is red, dense, and arranged in raised ridges running longitudinally and rather irregularly. The dense adenoid tissue is further gathered together in a more or less distinct prominence, called sometimes the pharyngeal tonsil, which may in adults be a quarter of an inch thick, but is much less in children. It has been thought that this formation was pathological, but it can be observed in the new-born, though very slightly marked. Sometimes we may detect in the posterior portion of the pharyngeal tonsil a depression or opening. This is the orifice of a sac, the pharyngeal bursa, covered by the mucous membrane, and which Luschka conjectures to be connected with the pituitary body during intra-uterine life. The sac is by no means constant, and other similar depressions may occasionally be seen. This part frequently is the seat of cysts.

Both anatomically and clinically, the region just described—the upper part of the pharynx—may seem entitled to further discrimination, but as the parts are brought into view in exploring the nares, they are conveniently described under the head of rhinoscopy, especially as the word pharyngoscopy has been applied to the examination of the pharynx by reflected light without the faucial mirror; that is, to inspection assisted by illumination, in which proceeding only those parts can be seen which are visible on ordinary inspection. If, therefore, we wish to distinguish exploration of the upper pharynx by a word, we should have to resort to naso-pharyngoscopy, since the upper pharynx, from its relations to the nose, is also termed the naso-pharynx.



In the practice of rhinoscopy the easiest plan is to pass a small mirror between the uvula and the anterior pillar on one side, and carry it gradually behind the uvula towards the median line. It is then to be withdrawn, taken in the other hand and introduced in the same manner on the opposite side. In this way we may often obtain an accurate idea of each portion of the rhinoscopic image and combine the two lateral views into one, when by a single introduction a much smaller extent of surface could be explored.

In pursuing this method the first point reflected in the mirror is the posterior surface of the uvula, closely following which, or appearing at the same instant, may be traced the posterior surface of the arches and velum, and perhaps one of the teeth will appear.

The mirror should now pass a little higher up behind the velum, which is followed by the eye as it spreads itself out until at the upper part it seems to finish in a sort of fleshy ledge, just above and behind which the septum nasi and nares come into view. A little patience will now enable the observer to make out the several parts which have been described.

Starting, then, in what may be called the second stage of his exploration from the septum nasi, the observer should trace this throughout its whole length. On either side of the septum, at the broad upper part may be discerned the nasal opening. This may be traced downwards to the red fleshy ledge already mentioned as formed by the velum, and which intercepts the view of the lowest portion of the opening. The nasal opening having thus been made out, we may proceed to trace its outer boundary, which will be

found to be formed by the projecting outlines of the turbinated bones. The most prominent and easiest to see is the middle, which appears at its lower border as if the inferior bone overlapped it. Just above this overlapping or upper part of the inferior bone, at the outer border of the middle turbinated bone, is the middle meatus, and upon the outer side of this we come upon the Eustachian orifice.

The reverse order may, of course, be adopted, and sometimes it will be found easier to begin with the Eustachian tube, and trace the other structures between it and the septum. Frequently, the Eustachian orifice is easily discovered by beginners, who find considerable difficulty in obtaining a clear image of the septum and turbinated bones. It is desirable to be able to start from any point, and follow the outline of all the parts as they come successively into view. This will be found possible after a little practice. The general outline of the image must, of course, be familiar to the eye, and then we may begin at any point and pass towards any other without confusion, just as when looking at a map of a locality we know, we glance from one spot to another without losing our consciousness of their relative positions.

It will be seen that a considerable extent of surface can be explored by means of rhinoscopy, and the value of this art may be inferred from the fact that any or all of the structures which enter into these parts may be the seat of disease, and the exact morbid condition may be brought to light in the mirror.

The use of the rhinoscope enables us not only to see the exact site of the disease and to determine its nature, but also to apply local treatment. The rhinoscope is therefore obviously of importance in congestion, inflammation, thickening ulceration, or other affection of any part of the mucous membrane which can be brought into view, while it often at once brings to light polypi or other nasal tumours, or demonstrates the cause of long-standing ozæna and enables us to cure this obstinate ailment.

Every form of nasal discharge should be investigated by rhinoscopy, which also affords aid in diphtheria and other acute diseases affecting the nasal passages. In obstinate rhinitis, purulent catarrh, abscess within the passages, hæmorrhages, and other painful or distressing ailments, the rhinoscope gives certainty in diagnosis and precision in treatment. Foreign bodies and concretions may be discovered and removed by the aid of the mirror; the conditions on which perversion or loss of smell depend may often be found out; and even in pure neuroses the absence of tangible change may be ascertained.

The various forms of disease to which the upper pharynx is liable can only be properly observed and treated under the guidance of the mirror, and even when the lower pharynx seems the chief seat of the morbid process most valuable information may be obtained by exploring the condition of the parts above.

In cases of deafness dependent on disease of the Eustachian tubes the rhinoscope is also useful, and



other illustrations of its value will naturally occur to the reader.

## ANTERIOR RHINOSCOPY.

This term has been applied to the examination of the nostrils from the front, which is a very useful supplement to the exploration already described. The patient retaining his position before the observer may be directed to incline his head so far backwards that the light is easily reflected into the nostrils, each of which can thus be examined. If the sides of the nostril be rather close together a probe or any convenient small instrument will easily separate them. If necessary, the nostril may be dilated by a bivalve aural speculum or any of the ordinary nasal dilators, of which Thudichum's is very convenient, as it does not require to be held *in situ*. In placing it the only caution needed is not to introduce it so far as to give rise to unnecessary pain. The instrument is composed of two distinct valves which are connected by a spring. When pressed together the valves form a narrow, oval canal, which can easily be inserted into the nostril, the spring being then allowed gradually to expand. One valve is shorter than the other and should be placed on the side of the septum so that a dilator is required for each nostril; it is further convenient to be furnished with several sizes. The instrument "is designed exclusively to expand the atrium or membrano-cartilaginous part of the nostril; if it were allowed to enter beyond this, and to reach the isthmus formed by the unyielding cartilaginous septum and the nasal margin of the ascending branch



of the upper maxillary bone, it would cause pain, and narrow by its own thickness this small passage." (a) To this it is necessary to add that it is sometimes needful by pressure to reduce the power of the spring to a minimum, and occasionally the parts are so tender that this dilator cannot be employed at all. To meet such cases Messrs. Maw, many years ago, made for me a dilator (Fig. 39) on the principle of the eyelid retractor, in which, by means of a screw, the degree of dilatation can be exactly graduated. The one commonly sold as Fränkel's is constructed in the same way. This instrument I constantly employ.

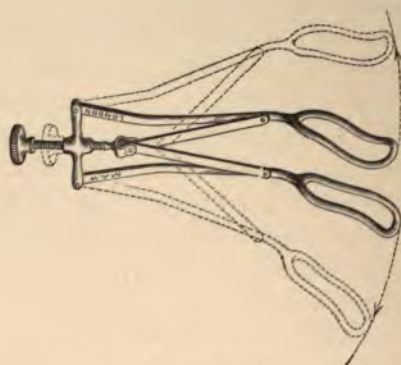


FIG. 39.

By anterior rhinoscopy we can explore the entire anterior portion of the nasal passage from the superior turbinated bone above to the floor below.

(a) "Polypus in the Nose." By John W. Thudichum, M.D. 1869.

The lateral boundaries of the nostrils, especially the inner one formed of the septum, should be carefully examined. This partition, which is of a pale red colour, does not often occupy the median line, but deviates a little to one side, most frequently to the left, so that the two nostrils do not present corresponding appearances. We may next note the condition of the prominence caused by the middle turbinated bone, the anterior surface of which looks towards us, and below it we trace the front and part of the inferior surface of the lower bone. Each of these three protuberances is pale, red, and shining. The inferior border of the middle prominence is normally so pale as to contrast with the rest of the membrane which covers this part. The inferior prominence is of a deeper red. The appearances may be much disguised by secretion. Sometimes it is necessary to wash out the passages with the syringe or irrigator. In other cases particles may be removed with cotton wool or a brush. The appearance of secretions in this part varies so much that mistakes may easily be made, and it is only by experience that all the differences of the view compatible with health can be appreciated.

In exceptional cases, when the meatus is large and unobstructed, we may see through to the pharynx while practising anterior rhinoscopy; but usually, in order to explore that region from the front, we should have to resort to some such contrivance as Zaufal's tubes. These resemble elongated ear specula, as they consist of cylindrical silver tubes, terminating at the proximal end in a funnel-shaped expansion. Zaufal

uses five sizes, the diameter being 3, 4, 5, 6, and 7 millimetres respectively. The total length is 9 to 11 centimetres, but as 3 are occupied by the funnel, the tube part will be only 6 to 8. Some operators object to the length of these tubes, and use specula 4 to 7 centimetres long. Voltolini employs short tubes in conjunction with Brunton's otoscope, but the illumination may be obtained by any of the other methods already described. Zaufal's specula enable us to examine portions of the posterior wall of the pharynx, but are most useful for the purpose of exploring the Eustachian orifices and their immediate neighbourhood.

Pathological changes of colour and form reveal conditions similar to those already discussed. Thus congestion, inflammation, swelling, erosion, ulceration, new formations, foreign bodies, perverted secretions, malformations, old cicatrices, and other changes can be investigated by anterior rhinoscopy, which also guides us in treatment. Occlusion of the passages occasioned in various ways may also be found, and relieved.

#### AUTO-RHINOSCOPY.

This term is used sometimes for the self-demonstration of the parts described in the same manner as auto-laryngoscopy in reference to the larynx.

#### PHARYNGOSCOPY AND CESOPHAGOSCOPY.

In speaking of rhinoscopy I showed that part of the pharynx can be very completely explored, and some have proposed to give this a distinct name, though we



might almost as well apply it to the simple inspection of the fauces. If, however, we turn our attention to the upper portion of the alimentary canal we find it is not so easy to examine as is the air tube. The pharynx, indeed, is easily explored. Its posterior wall can always be seen without a mirror, while with one the upper walls and roof may, as we have shown, be easily brought into view; but turning our attention downwards we are arrested.

Many efforts have been made to overcome the obstacles offered to the exploration of the œsophagus by reflected light. The walls of this tube fall together instead of remaining open like the larynx and trachea. Hence it is necessary to have some mode of separating the walls at the same time that the light is directed along them. Semeleder has, perhaps, done more in this direction than any one, and by practising upon himself has demonstrated to others a portion of the tube. One inch or two may, with perseverance, be revealed, but the operation is very trying, and seems more likely to be practised for curiosity than with the hope of its becoming of any great clinical use. It is no easy matter to tolerate a tube in the position required, much less the movement of such a tube, so as to expose successive portions of the membrane. Happily, the œsophagus can be explored by other methods.

#### PALATE-MYOGRAPH.

Dr. Harrison Allen (*a*) introduces a rod through the

(*a*) "A New Method of recording the Motions of the Soft Palate," 1884.



nostrils, and holds it in position by means of a wire which descends from an ordinary forehead-band. The proximal end of the rod is next brought into connection with a Ludwig Kymographion. He has thus been able to record in a tracing the movements of the soft palate. He anticipates that the "palate-myograph," as he calls his instrument, will be of use in studying disease. In paralysis of the soft palate, of course, the movements will be abolished; we may, therefore, detect and demonstrate this condition by the palate-myograph. Perhaps by the same plan we may be able to determine the degree of degeneration of the levator palati which may have taken place.

Dr. Allen suggests that stammering may be studied by this method, and that it may be of use in the instruction of the deaf and in the comparative study of language. The plan of holding the rod by a flexible wire suggests that the same method may be utilised for keeping snares and other instruments in position during operations in the nose and nasopharynx.

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## IX.

### HISTORY OF LARYNGOSCOPY.

Early Efforts. Horace Green. Czermak. Türck. Garcia's Prior Discovery. Liston. Avery. Bozzini. Levret. Senn. Baumés. Cagniard de Latour. Warden. Babington. Bennati. Trousseau and Belloc. Selligue. Recent Writers.

THE history of the laryngoscope closely resembles that of many other inventions. We find that several persons at various intervals were intent on the endeavour to obtain a view of the interior of the larynx during life. Some, indeed, seem to have actually seen the glottis, others, without clearly defining them, discerned in a mirror parts otherwise invisible, and all succeeded more or less, according to the patience they brought to bear on the problem, and the methods and instruments they employed. Thus it is that several persons only just missed being recognised as the inventors of the laryngoscope, and when at length the instrument was perfected and its value demonstrated, more than one claimed a share in the honour of discovering so great an addition to our means of investigating and treating disease.

In what we may call the pre-laryngoscopic era, Dr. Horace Green (a) had taught that topical remedies might be applied to the larynx with advantage. It was by calling in reflected light, as a guide in operating after his method, that my own early success was obtained. At that time I was not aware that a plan of illuminating the larynx which was destined a little later to lead to such brilliant results had already been described in the "Proceedings of the Royal Society," but had failed to attract the attention of medical writers.

In 1858 Czermak's first announcement was made in the *Wiener Mediz. Wochenschrift*, immediately after which he submitted to the Vienna Academy of Science an account of his experiments in a paper entitled "Physiological Researches with Garcia's Laryngoscope." (*Physiologische Untersuchungen mit Garcia's Kehlkopfspiegel.*)

The title of this paper is very striking. Czermak here calls the instrument with which his first experiments were made, *Garcia's* laryngoscope, or larynx-mirror. He had, as we know from his own statement, borrowed Garcia's instrument from Professor Türck, who had previously attempted to utilise it for diagnosis in the wards of the General Hospital at Vienna.

Garcia, an able professor of singing still living, had used his mirror to investigate the physiology of the voice, and that so successfully that he had four years previously described to the Royal Society of London

(a) "A Treatise on Diseases of the Air Passages." By Horace Green, M.D. New York, 1849.



the appearances presented by the human larynx during life, as determined by experiments made on himself. He had, in fact, discovered and applied the art of auto-laryngoscopy. Nay, more, we have since been told by Dr. Mandl (*a*) that in sending him a copy of his paper, Garcia had urged upon him to apply his method to the investigation of diseases of the larynx.

This paper of Garcia's was read at the Royal Society, and printed in the "Proceedings." (*b*) Notices of it appeared in the Continental papers, and attracted the attention of Professor Türck, who set to work to test the method. He does not appear to have been very successful, and this need not surprise us when we learn that he confined his efforts to the use of direct sunlight, which even in Vienna, is not always at the service of experimenters. Czermak soon found out the value of the mirrors Türck had lent him, and set to work to improve the method. He rendered himself independent of the weather by using artificial light, and he availed himself of the ophthalmoscopic mirror to bring the rays to a focus on the laryngoscope. Following up the discovery with the utmost enthusiasm, he perfected the apparatus, drew the attention of the medical world to the extensive field of research thus opened, and received in all directions the credit of being the discoverer of the laryngoscope. It is clear, however, that he was much indebted to others. But for Türck he might never have heard

(*a*) "Traité Pratique des Maladies du Pharynx et du Larynx." Paris, 1872.

(*b*) "Proceedings of the Royal Society of London," vol. vii, pages 399 to 410, 1856. Meeting of May 24, 1855.



of Garcia's laryngoscope. While, therefore, we accord to Czermak the highest praise for his indefatigable efforts to popularise the method, and for the many improvements he effected in it, it is impossible to ignore the immense services that Garcia has rendered to our art, or to deny him the honour of priority in the discovery.

Garcia did not merely make a suggestion and leave others to test it. He completed the discovery of auto-laryngoscopy, and further, by means of that, he described to the most critical scientific body in the world the physiology of the human voice as demonstrated by his method. In the light of all that has since been done, the accuracy of the descriptions first recorded by this ingenious and scientific professor of singing is most remarkable. His paper would have done credit to expert anatomists and physiologists, and reading it now, one cannot but wonder that the Royal Society did not confer some signal reward on the accomplished author. In the first edition of this work Garcia's paper was reprinted in full. Since attention was thus prominently drawn to his claims they have been generally admitted, and in 1877 they were publicly recognised by the presentation of a testimonial.

We have seen that Garcia's paper was known to Türck, who had endeavoured to utilise the discovery, and that from the latter Czermak first heard of the method of exploring the larynx. It is to be regretted that a dispute as to priority should have arisen between Türck and Czermak, especially considering what others had done. Czermak so improved the

laryngoscope as to make it far more easy to use. He substituted the concave mirror for the plane one used by Garcia, taking the idea from the ophthalmoscope. He used artificial light and designed a complete and portable apparatus. He illustrated the value of the instrument by public auto-laryngoscopic demonstrations, and travelled to Paris and then to London for the purpose of thus stimulating others to occupy themselves with the subject. Moreover, he extended the use of the method to the exploration of the posterior nares, and thus originated the art of rhinoscopy, while the cases he related sufficed to prove the clinical value of the method. It is impossible to over-estimate the influence this enthusiasm had in rapidly diffusing a knowledge of the value of laryngoscopy throughout the medical world, nor can we deny that but for him the art might have been once more forgotten. Still we must not forget the claims of others.

Türk seems to have been roused by Czermak's success to new efforts. He at once put in his claim to priority—a claim as to which there can be no question—and he henceforth worked constantly at the subject. The result was that he produced a most elaborate and complete work on the subject, in which he recorded numerous cases, and depicted the laryngoscopic appearances. His "Klinik," and the accompanying "Atlas" of coloured plates, remain as monuments of the skill and industry with which he followed up the art of laryngoscopy in all its ramifications.

In his earliest papers Czermak spoke of the laryngoscope as Garcia's. Later he seems to have dis-

covered that Liston had proposed to use a dentist's mirror dipped in warm water to explore the glottis (*a*) and accordingly spoke of the "principle of Liston and Garcia's method of inspecting the larynx." Liston had proposed this when writing of swellings which obstruct the larynx, and even then seemed to rely more on the touch, so that it is doubtful how far that skilful surgeon expected to see. The passage is as follows:—"The existence of this swelling may often be ascertained by a careful examination with the fingers, and a view of the parts may sometimes be obtained by means of a speculum—such a glass as is used by dentists on a long stalk, previously dipped in hot water, introduced with its reflecting surface downwards, and carried well into the fauces."

Subsequent writers have found that both before and after Liston many others had similar ideas, and even seem to have come much nearer to the discovery, some, as already mentioned, scarcely escaping it.

Thus Mr. Avery seems about 1844 to have invented an instrument that may be called a laryngoscope, inasmuch as he fixed a mirror to a speculum and adapted a lamp to it. Mr. Avery seems to have applied himself with considerable success to the exploration of the passages of the body, and amongst them of the larynx. Being himself possessed of great mechanical skill, he constructed his own instruments, which were much admired at the time, but a description of them was not published until a later date, when the late Mr. Yearsley called attention to his

(*a*) "Practical Surgery," Third Edition. 1840.



claims. (a) But he exhibited his instrument in 1846 at the meeting of the Provincial Medical Association at Norwich. (b)

But Avery's lamp was scarcely new, for at the beginning of the century Bozzini had incurred considerable odium by an invention of the same kind, with which he claimed to be able to see the interior of the passages of the body. Nay, long back in the former century—before its middle—in 1743, French authors claim for their celebrated accoucheur and inventor, Levret, that he had applied the principle of the laryngoscope by the mirror he used in connection with a speculum of his own invention in applying ligatures to polypi behind the velum.

It is not improbable that earlier citations will yet be made, but it is clear that these men only foreshadowed, as others did, what was to be achieved.

Dr. Senn, of Geneva, had a faucial mirror constructed in 1827, but an account of it was not published (c) until two years later. Dr. Baumés also used a faucial mirror which he brought before the Lyons Medical Society (d) in 1838.

Cagniard de Latour employed a second mirror to direct (e) the light, and thus seems to have nearly anticipated Garcia, for that was in 1825, in seeing the vocal cords. He failed to see the glottis, but had he

(a) *Medical Circular*, vol. xx, 1862.

(b) See *British Medical Journal*, June 10, 1882, p. 855.

(c) *Journal des Progrès des Sciences*, 1829.

(d) "Compte Rendus des Travaux de la Soc. de Med. de Lyon," 1838.

(e) "Physiologie de la Voix." Par Ed. Fournié. Paris, 1865.



tried on several persons he would assuredly have accomplished his object.

It was after this that Dr. Warden, of Edinburgh (1844), endeavoured to illuminate the larynx by means of prisms.

As early as 1829 a distinguished English physician, the elder Babington, had publicly exhibited an instrument which he called a "glottiscope," and in which the principle of laryngoscopy was clearly exemplified. So many claims to priority have been put forward, that it will perhaps interest the reader to peruse the terms in which Dr. Babington's discovery were recorded at the time. The following passage is therefore extracted from the *London Medical Gazette* of that year:—

#### HUNTERIAN SOCIETY.

March 18, 1829.

DR. BILLING, President, in the Chair.

DR. BENJAMIN BABINGTON submitted to the meeting an ingenious instrument for the examination of parts within the fauces not admitting of inspection by unaided sight. It consisted of an oblong piece of looking-glass set in silver-wire, with a long shank. The reflecting portion is placed against the palate whilst the tongue is held down by a spatula, when the epiglottis and upper part of the larynx become visible in the glass. A strong light is required, and the instrument should be dipped in water so as to have a film of the fluid upon it when used, or the halitus of the breath renders it cloudy. The doctor proposes to call it the *glottiscope*. (a)

The claim of Dr. Babington to be considered the inventor of the laryngoscope was brought before the

(a) *London Medical Gazette*, vol. iii., p. 555, 1829.

Royal Medical and Chirurgical Society of London on the 26th April, 1864, by Dr. M. Mackenzie, who exhibited the original instruments and the maker's invoice. It seems that Dr. Babington employed a hand-mirror to reflect the light of the sun on to the faucial mirror, which he at first combined with a tongue depressor. Of course, the principle of laryngoscopy was here acted upon. The "glottiscope," as the inventor called it, was, in fact, a laryngoscope such as we now use; but we find that a concave mirror is better, as it brings the rays of light to a focus where their illuminating power is required, and artificial light is more manageable. Had Dr. Babington employed artificial light it is probable his experiments would have been more numerous and more successful. It cannot, however, be denied that he had really invented and used a laryngoscope.

Dr. Babington was present himself at the society when his claim was thus brought forward after the instrument had been perfected by others, who claimed to have invented it. He stated (a) that at the time his instruments were invented a great deal was being said about infiltration of the glottis, and it occurred to him that it was desirable to seek means of examining the glottis more narrowly. With his instrument he had seen ulceration on the epiglottis, but he confessed that he did not contemplate looking through the glottis. He expressed himself obliged for the remarks made in the debate, "although he considered that he had been praised far too highly." In this the reader will scarcely coincide, but put it

(a) *Medical Times and Gazette*, May 7, 1864.

down to Dr. Babington's modesty, for assuredly he had done much, and deserved much credit.

Soon after the late Dr. Babington, a Parisian physician, Dr. Bennati, employed an instrument made for him by a skilful workman, who was under his care for laryngeal disease. This fact was brought before the Academy of Medicine of Paris by Messrs. Trousseau and Belloc, in their classical work on "Laryngeal Phthisis," which is included in the "Memoirs of the Academy," &c., vol. vi., 1837.

At a later date Trousseau reverted to the subject in his clinical lectures. Speaking of œdema of the larynx, he observes that it is unquestionably of importance to ascertain the existence of lesions, and then adds:—

"Examination of the larynx by a suitable speculum was felt to be a likely means of attaining this end. Long prior to 1837, when Dr. Belloc and I published our treatise on laryngeal phthisis, this idea had engaged the attention of practitioners; and at the date of our publication we were occupied with the construction of a *speculum laryngis*. At that time likewise M. Selligie, an ingenious mechanician, who was also a sufferer from laryngeal phthisis, made for his physician an apparatus consisting of two tubes, one for throwing light on the glottis, and the other for affording a view of the image of the glottis as reflected in a mirror placed at the guttural extremity of the instrument. There were, however, serious defects in this instrument; and the difficulties in applying it were so great that I long since ceased to use it. Laryngoscopy has been carefully studied in England and Germany, and you can read in the *Archives Générales de Médecine* for February, 1860, an account by my friend, Dr. Lasèque, of the results arrived at by our colleagues on the other side of the Channel, and beyond the Rhine. When laryngoscopy shall have attained a greater degree of perfection



it will no doubt render service not only in the diagnosis but also in the treatment of laryngeal affections—particularly in the treatment of œdema of the glottis, for sight ought certainly to assist the hand in the application of the topical remedies which are of such essential importance in treating that affection." (a)

Levret called (b) his instrument a *speculum oris*, and it is designated by a modern writer who has described and figured it (c) a laryngoscope. It certainly cannot be properly called a laryngoscope, for it could never illuminate the larynx, however useful it might prove in the operations for which it was designed. It merely combined a gag with a tongue-depressor, and a mirror to reflect the polypi. It was, in fact, an improvement on the *specula oris* in use before Levret's time, one of which was figured in the works of Ambrose Paré in 1641, while others were mentioned by still earlier authors; but all these early instruments may be looked upon as tongue-depressors or mouth gags, in combination with simple mirrors, such as dentists have used from the earliest times. These certainly ought not to be spoken of as laryngoscopes.

In a foot-note in his pamphlet just cited, Dr. Gibb claims to have used a steel mirror for inspecting the laryngeal surface of the epiglottis and other parts by

(a) "Trousseau's Clinical Medicine." New Sydenham Society's edition. Lecture xxvi., vol. iii., p. 98. Translated by J. R. Cormack, M.D.

(b) "Observations sur la Cure Radicale de Plusieurs Polypes de la Matrice, de la Gorge, et du Nez." Paris, 1749.

(c) "The Laryngoscope in Diseases of the Throat." By George Duncan Gibb, M.D., 1861.



direct light, a year before Czermak's first visit to London, and tells us that he figured it in 1860. This, however, was after the announcement of the discovery of the laryngoscope had been made in Germany and France. Indeed, Mandl's French translation of Czermak's work, from which Gibb translated it into English, (a) was dated 1860, and that work was described by its author as a second edition of all the articles he published in various journals during 1858 and 1859.

Dr. G. Troup Maxwell (b) has ventured to claim for himself and for America the honour of having invented the laryngoscope on the ground that he devised an instrument in 1859 which "reflected perfectly the whole of the posterior face of the epiglottis, the glottis with the vocal cords, &c.," though he did not appreciate its importance, until he read the next year the encomiums passed on Czermak for obtaining the same results. Dr. Maxwell claims—1. Originality as an inventor. 2. Priority in the successful employment of the laryngoscope in America. Both these claims may be admitted, but it seems necessary to remind him that neither Türck nor Czermak were the first to see the vocal cords. Dr. Maxwell seems to think that Czermak's results were not known in Europe until 1860; but he may be informed that they were published in Germany during the two previous years. Czermak tells us he began his laryngoscopic experiments in the winter of 1857, his object being to obtain a

(a) "New Sydenham Society." Vol. xi. Selected Monographs, 1861.

(b) *Medical Record*. New York, January 15th, 1873.

clear idea of the mode of producing the Arabic *true gutturals*, and to verify and complete Garcia's physiological investigations. He adds that by a new method, viz., using artificial light and a large ophthalmoscopic mirror, he soon discovered the practical value of the laryngoscope, and his first paper was printed in the *Wien. Med. Woch.*, March 27, 1858.

The labours of Türck and Czermak stimulated a number of other able observers to devote themselves to laryngoscopy, and the result has been an advance in the art almost without parallel.

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## X.

### LARYNGOSCOPAL DIAGNOSIS.

Practical Uses of Laryngoscopy. CHANGES IN COLOUR. Variation of Colour in Parts in Health. Hyperæmia. Congestion and Inflammation of Various Parts. Anæmia. CHANGES OF FORM. Increase of Substance. Swelling. Œdema. Infiltration. Thickening. Hypertrophy. Phthisis. Syphilis. Exudation. Diphtheria. Deposit of New Tissue. Cancer. Lupus. Elephantiasis. Polypi. DECREASE OF SUBSTANCE. Atrophy. Degenerations. Necrosis. Gangrene. Ulceration. ACCIDENTAL CHANGES Affecting Colour or Form. Pigmentation. Foreign Bodies. DISEASES NOT AFFECTING COLOUR OR FORM. Interference with Movements. Spasm. Paralysis. Stammering of Vocal Cords. Sensory Neuroses.

THE laryngoscope is an instrument which enables us not only to discover, but to treat diseases of the larynx; its practical uses may therefore be considered in reference both to diagnosis and therapeutics.

Laryngoscopy is merely the art of bringing within the field of vision certain parts that are ordinarily out of sight. It therefore renders easy the detection of diseases, which, without it, can only be guessed at. True, before the introduction of the laryngoscope into medical practice, many shrewd guesses were made by great men, but anyone who compares the literature of



the pre-, with that of the post-, laryngoscopic period cannot fail to be struck with the extent to which certainty has taken the place of probability in diagnosis. When we remember that the advance has been almost as great in treatment, we need not be surprised that laryngoscopy has taken so high a place in the estimation of those who are competent to pronounce on its claims.

The first practical use of the laryngoscope is as a means of physical diagnosis. The appearance of the laryngeal image in health has already been described at some length. It has, moreover, been mentioned that any deviations from those appearances must be attentively observed. It is to the discovery of such deviations from the normal condition of the organ of voice that the attention of the laryngoscopist is constantly directed. Some deviations may take place within the limits of health, and variations in natural conformation are not to be confounded with the changes produced by disease. Most of these are deviations either in colour or form, and may be separately considered. Of course, it is necessary to establish first of all a normal standard, and this has been done as to form, by the description that has preceded. Such descriptions give far less satisfaction as to colour. Hence it is the more necessary to study it by attentively examining the healthy human larynx.

Difficult as it is to describe colours, I will proceed to specify some of the main features of the colouration of a healthy larynx as a prelude to speaking of changes in colour. The natural standard depends on the construction of the parts. It is to be remembered



that the interior of the larynx at which we look, is covered with mucous membrane, the density and blood supply of which vary in different parts, while the sub-mucous tissues vary still more. The colour of the interior of the larynx may be compared to that of the mouth, the two vocal cords standing out in marked contrast, as white. There is, however, considerable difference in the depth of hue of the several parts. Thus, on the lip of the epiglottis, the yellow of the fibrous cartilage seems to shine through the pink mucous membrane. This is not observed in the cushion, which therefore looks bright red. The upper surface of the valve presents a more obscure colouration. The cornicula stand out in relief, being of a deeper, richer hue than the surrounding parts. The arytaeno-epiglottidean folds are much lighter, closely resembling in colour the gums, while the false cords may be said to be a shade between these folds and the cornicula.

#### CHANGES OF COLOUR.

Now changes in colour may affect the whole larynx, or be localised in any of its parts. The natural red colour of the mucous surface may be either increased or diminished. In the one case we have hyperæmia; in the other, hypoæmia, or as it is commonly called, anæmia. Sometimes such changes have taken place that it is not easy to say whether they have been brought about or depend on the one state or other. It is obvious, however, that any change in the circulation of the blood in a part may materially affect its colour. Besides increased or decreased redness, we also meet

with distinct alterations of colour, *e.g.*, in cyanotic children there is a blue tinge of the surface, and in jaundice the membrane may acquire a yellow colour. To appreciate the latter the examination must of course be made with white light, the ordinary artificial light being itself of a yellow hue.

Diseases characterised by hyperæmia are easily detected, and in the mirror we can see the exact part of the larynx that is thus affected. Even a temporary hyperæmic condition caused by exertion or slight irritation is thus made manifest, though of course this is not so often under observation as more permanent congestions. In practising auto-laryngoscopy the student may notice a momentary blush towards the close of a prolonged note, and this may suggest to him the explanation of the injury which sometimes results from over-straining the voice. A certain degree of congestion may often be seen in youths whose "voices are breaking," and would seem to be merely an index to the active growth going on in the organ. A more acute congestion may be seen after the distress caused by a particle of food "going the wrong way" has subsided, and a more chronic form may result from paroxysms of cough, as in pertussis, &c.

In acute laryngitis the redness is more intense, and usually accompanied by swelling. Both true and false cords become deeply injected, vessels may be seen on their surface, and the locality of the aryænoids is so much affected that these bodies present the appearance of two red spheroids, as seen in Plate i., Fig. 1. In chronic laryngitis the redness is less intense, and the hue varies with the locality, as in Fig. 2. Thus

in these congestive diseases we have increase of colour, the intensity of the redness and the tinge presented sufficing to determine their differences. According to the degree of congestion we have a mere blush of redness, or the colour may be of the deepest red, approaching livid.

Besides the active hyperæmia dependent on congestion from the arterial side of the circulation, we may see passive venous congestion, in which case the characteristic dusky, or bluish, tinge takes the place of the bright red. Such a condition may result from cardiac disease, emphysema, or any obstruction to the venous circulation.

There is a great difference in the shade of colour in the congestions met with in phthisis and syphilis, so much so, indeed, that to those who have much experience, the hue is as suggestive in affections of the throat as in those of the skin.

Instead of increased redness there may be want of colour, a true hypo-æmia, or as it is called, anæmia of the larynx, a condition to which I have long attached considerable importance, especially in reference to the early stage of consumption. Semeleder and Tobold are of a similar opinion, and though many others do not admit it, I am thoroughly convinced of the importance in this and other respects of noticing any approach to anæmia. It is true that pallor of the laryngeal mucous membrane is to be found associated with general anæmia arising from any cause. It may be studied when the system has been blanched by sudden hæmorrhage, or in a state of convalescence from acute diseases, or in chlorosis, amenorrhœa, and



some other states. It is to be presumed that the student would not confound pallor coincident with a general condition with the laryngeal anæmia to which attention is directed, and which may be present when a florid complexion and ruddy lips show that general anæmia is out of the question.

In regard to changes of colour localised in parts of the larynx, the importance of the disease depends on the degree with which it interferes with the functions. A slight hyperæmic condition of the true vocal cords at once manifests its presence by affecting the voice, a fact which singers will at once appreciate. The condition can be easily seen with the mirror, the whiteness of the ground bringing it into full relief. Sometimes one or both cords may be deeply congested without much hyperæmia elsewhere. They may then be quite red, and blood-vessels may be seen running along them. In old cases the colour is less intense, and the cords may present a dirty-red, brownish, or muddy hue, their lustre, which is early diminished, being quite gone. Increased redness of the false cords is not so prominent, but can always be readily detected, and here swelling or thickening is more marked. The cornicula are very liable to suffer from congestion, and the deepening of their colour is at once manifest. We must not, however, hastily conclude that they are inflamed because they look redder than the surrounding parts, for, as just mentioned, their natural hue is considerably deeper. I have several times seen beginners erroneously conclude they were congested; and the same caution may be offered regarding the cushion of the epiglottis,



which is naturally redder than the lip. Moreover, as already stated, vessels may be seen on either surface of this valve in a state of health, so that a hasty diagnosis of congestion is not to be made. Occasionally it is almost exclusively affected, but more frequently it remains healthy throughout a chronic laryngitis. Passive venous congestion may set up a varicose appearance, most common on the epiglottis but this state may be present in other parts, and distended veins have been described as running along the orifice of the ventricle, and the false and true cords.

#### CHANGES OF FORM.

Alterations in form constantly follow those of colour, and sometimes accompany them from the beginning. Swelling is as constant a symptom of inflammation as redness.

Acute laryngitis is liable to give rise to œdema. This is very dangerous, since a slight degree of swelling may suffice to close the glottis, the narrowest part of the air-tube. Hence laryngeal œdema—or, as it is somewhat inaccurately called, œdema glottidis—is one of the most formidable and rapidly fatal diseases. When œdema has taken place we have no longer the intense redness of the preceding stage, the effusion being only covered with the thin mucous membrane, which, although hyperæmic, when thus stretched loses much of its colour. We have, however, change of form. The swelling may be distinctly seen in the mirror, and its shape and extent made out. The epiglottis is generally not only intensely red, but con-

siderably swollen. The laryngoscope is, in this case, a sure guide to treatment, enabling the operator to employ with effect the laryngeal lancet, and thus let out the fluid which is the cause of suffocation.

Other swellings, more localised, may be observed. From this cause the epiglottis often completely changes its form. In consumption it sometimes increases so much in thickness as to interfere greatly with the exploration of the interior of the larynx. In the same disease we frequently meet with tumefaction in other parts. The arytaeno-epiglottidean folds are specially liable to be affected in this way; even in the early stages of laryngeal phthisis these folds are not only swollen but thickened. Sometimes only one side of the larynx is swollen, but in most cases both folds are involved. Unilateral, or rather any well-defined swelling, suggests more localised disease, *e.g.*, abscess. Although an abscess may be superficial, it is more frequently associated with deep-seated disease, such as perichondritis. Exfoliation of either of the laryngeal cartilages may occur, after which, very rarely, spontaneous cure takes place, but leaves great deformity, with usually stenosis. Sometimes pieces of dead cartilage have been discovered and removed by the aid of the laryngoscope. In other instances they have escaped without interference, and in others have proved fatal by suddenly blocking the air-tube. Perichondritis sometimes results as a sequela of typhoid, &c.

The tissues around the cornicula are also very liable to enlarge in consumption. At an early stage they often appear slightly congested. Swelling may suc-

ceed, and in time the outline of the posterior part of the larynx be completely changed. The division between the cartilages cannot be distinguished, on account of the swollen condition of the parts, and the ary-tænoids, the cartilages of Wrisberg and Santorini, look like single, round, or oval bodies—one on each side (Plate III.). The swellings just described in phthisis are pale, and look so transparent that the beginner might easily fancy them to be produced by clear fluid, effused beneath the mucous membrane. Simple œdema is, however, more transparent, for in phthisis the membrane itself seems to have lost some of its transparency by a deposit which makes it look thickened. In reality this is its condition, and thickening may often be detected at an earlier period. Although these swellings are usually pale, they may at any time during the course of the disease become more or less congested, the colour varying with this condition at the time of examination (Plate III.).

So much stress has been laid on the swelling in this region as diagnostic of phthisis, that it seems desirable to insist on the still greater importance of thickening. It is commonly stated that these swellings are pathognomonic of phthisis, but many authorities consider this as erroneous. We must, therefore, look upon it for the present as doubtful. I have seen œdema present precisely the same appearance in the mirror, both as regards shape and colour, but usually the thickening is sufficiently evident. Of course we are now only speaking of the appearance in the mirror at this point. Other evidences enable us to discriminate between these conditions. When the



swelling is marked with a number of superficial yellow points, looking as if yellowish matter were being exuded from enlarged follicles, the appearance is regarded as more significant, though we are not to conclude that these yellow points are actually due to the deposit of the tubercle.

This thickening is not to be confounded with a somewhat similar state that is sometimes met with in syphilis. In the latter disease it is more irregular in form, and speedily goes on to ulceration, while the thickening that follows extensive ulceration of this kind is accompanied by great deformity. In fact, syphilis attacks the several tissues of the larynx in the same way that it affects the same structures in other parts. Hence mucous patches, condylomata, gummata, and other changes may be seen with the laryngoscope. Still later, the results of the ravages of syphilis are seen in perichondritis, necrosis of the cartilages, and extensive cicatrices, producing great deformity and frequently considerable stenosis.

It will readily be understood that several other conditions exist, characterised by change of form from increase of substance, and which may be spoken of as swelling, thickening, hypertrophy, infiltration, &c. Most of these arise in and are accompanied by inflammation. In fact, this process in the larynx is particularly manifested by the two first terms of its ancient definition—*Rubor et Tumor*.

Instead of tumefaction of the tissues giving rise to change of form, a similar result may be brought about by the presence of abnormal substances. Thus the

mucous membrane may be covered with an exudation, when the passage of the glottis may be quite as seriously narrowed as by swelling. The exudation that occurs in croup and diphtheria thus interferes with the respiration, and may be seen reflected in the laryngoscope, which therefore may give us important information in reference to the chance of relief offered by tracheotomy.

In like manner we may see pus or blood in the larynx when suppuration or hæmorrhage has taken place in that organ, or elsewhere in the respiratory tract. The importance of distinguishing the origin of such hæmorrhage or suppuration will be obvious to the reader.

Any of the natural tissues may be simply hypertrophied, and it may be difficult to draw the line between such hypertrophy and adventitious substance. It is in this way that many neoplasms originate.

Polypi occur in the larynx far more frequently than was supposed in the pre-laryngoscopic period. These growths are as various in structure as in other organs. All may be included under the term increase of substance, inasmuch as they arise either from hypertrophy of the natural tissues, or the deposit of new material. Their exact position and shape are revealed by the laryngoscope, which further enables us, in suitable cases, to remove them by mechanical means *per vias naturales*, or to treat them by the application of chemical remedies to their surfaces. The most common and varied are papillomata, which spring up

not only where the mucous surface is abundantly supplied with papillæ, but even where it is destitute of them. Small proliferations of any shape, warts, and larger tumours, may be of this nature. Often they are multiple and extensive. Fibromata are generally pedunculated. Cysts are not so frequent. Myxomata and lipomata are very rare. The effects produced by a benign growth in the larynx vary with the size, shape, and seat of the neoplasm. Thus the larynx may be almost blocked up, or the growth may be only just visible, and any size between these extremes may be met with. So the shape or position may be such as to interfere with the movements of the vocal cords or leave them unaffected. Certain proliferations which appear in phthisis or syphilis should be carefully discriminated.

Increase of substance also occurs from the deposit of new tissue. This has been incidentally alluded to in speaking of phthisis and syphilis. Another example is cancer, in which the deposit of new substance is as marked as it is sometimes rapid. Epithelioma is the form of cancer most common in the larynx, where it may occur primarily, or by extension from the pharynx, œsophagus, or tongue. Sarcoma, which is usually of the spindle-celled kind, may, from its excessive tendency to return, be regarded as malignant. Cancer has often made considerable progress before it is seen by the laryngoscopist. At an early period the diagnosis may be difficult. The appearances will vary with the nature, position, and extent of the disease. On the vocal



cords it is more easily recognised. Lupus of the larynx, of which Professor Lefferts gives (a) an excellent description may be named here. Only ten cases have been recorded, and three of these are perhaps doubtful. *Elephantiasis Græcorum* may also affect the larynx, producing appearances resembling those of the cutaneous surfaces.

We turn now to the opposite direction—decrease of substance. As diminution of colour may occur from deficient blood supply—anæmia—so this, in its turn, may give way to wasting of tissue—atrophy. General atrophy of the larynx is a term sometimes applied to the condition met with in the aged, when, although the cartilages have become ossified, the removal of the softer structures renders them more transparent, and the mucous membrane and sub-mucous tissue appear to diminish in thickness. Such a state, *minus* the ossification, may also be met with in long-standing anæmia or cachexia, or in the course of wasting diseases. Moreover, the tissues may undergo metamorphosis at the same time, and then in place of simple atrophy we have degeneration; fatty, lardaceous, or other.

It is to be remembered, however, that degeneration may accompany increase as well as diminution of tissue.

Necrosis and gangrene imply loss of substance, but they are almost invariably preceded by processes that cause tumefaction.

(a) *American Journal of the Medical Sciences*, CL., April, 1878.

The most common form of disease characterised by loss of substance is ulceration. This, too, it may be said, is preceded by the prior process of inflammation, in which the opposite condition of increase of substance, or at least tumefaction, is present. This stage has, however, often passed away before the laryngoscopist sees the case. It may be added that ulceration in one part causing great loss of substance, is commonly accompanied by considerable swelling of other portions of the larynx.

Ulceration may be simple, phthisical, or syphilitic. The two latter are by far the most common. Indeed, the late Dr. Mandl (*a*) stated he had never met with a case of catarrhal ulceration. It is then important to distinguish between the forms of ulceration, and this is not usually difficult. In phthisis we find that ulceration is preceded by a stage of congestion, with thickening. It mostly begins in minute points, and gradually extends. The larynx presents a general appearance of pallor, even when portions, as already described, are both red and swollen. The true and false cords are both liable to attack, and in advanced cases seldom escape. The posterior commissure and the arytaenoids are often affected at a comparatively early period, and the epiglottis is not unfrequently the seat of the disease—its edge appearing sometimes completely serrated. (Plate III., Fig. 2.) In reference to the position of the ulceration, the student will not forget the distribution of the glands in the larynx.

In secondary syphilis ulceration is not common,

(*a*) *Op. cit.*, p. 382

but in the tertiary stage it attacks the epiglottis, the arytaenoids, the true and false cords, and the arytaeno-epiglottidean folds. Syphilitic ulceration is usually deep and rapid, and gives rise to extensive loss of substance, and the deeper, dusky-red hue contrasts strongly with the appearance of phthisis.

#### ACCIDENTAL CHANGES.

Besides varieties of colour or form, or both, as the result of disease, we may trace accidental changes. Thus, in miners and others, the inhalation of dust of various kinds may cause the deposit of material of any colour or form in the larynx. Such pigmentation is quite superficial, but may obviously set up disease. Soot, dust, and atmospheric impurities may produce similar results. Stains may also be produced by substances swallowed, while gargles, inhalations, and sprays have caused stains which have puzzled beginners. So the secretions of the respiratory mucous membrane—normal or abnormal—may give rise to unexpected appearances, and blood and pus, either in large or minute quantities, may be reflected in the mirror, which may enable us to determine the spot from which they have escaped.

A curious and rare accident is collapse of the ventricle, which might be mistaken for a neoplasm. Dr. Lefferts had a case of prolapse of both ventricles, and the gratification not only of diagnosing a unique case, but by a bold operation of curing the patient.

Another accidental change is the intrusion of foreign bodies into the larynx. Their appearance and



position are revealed by the laryngoscope, which often enables us to extract them *per vias naturales*, or to determine the moment for resorting to other operative procedure. A list of the foreign bodies which have been drawn into the larynx would occupy no small space. Pins have not uncommonly been sucked into the air-tubes from the pernicious habit in which some women persist of holding them in the mouth. Articles of food, or bone, or other things mixed with the food, are among the common intruders. Occasionally a bolus of masticated food large enough to close the air-tubes has been drawn into the larynx, and so caused sudden death. Coins, toys, any article put in the mouth, may unfortunately be sucked into the air-passages. The results will depend on the size and shape of the foreign body, and the position in which it lodges. Size and shape permitting, it may pass the glottis into the trachea and fall into one of the bronchi, probably the right, on account of its size and angle of divergence. It may be necessary to perform tracheotomy, but in many cases the laryngoscope has enabled us to dispense with this operation.

Accidental changes of form are also produced by wounds, contusions, and other injuries. Dislocation and fracture of the cartilages have been the results of violence. In gunshot injuries there is always the question of the presence or absence of the projectile. In all these cases of formidable injury other parts are also involved, but in any the laryngoscope may render useful service.

Before dismissing the subject of changes of form, we may mention that the laryngeal canal may be

narrowed and deformed by causes external to itself, such as the pressure of a bronchocele, aortic aneurism, or other tumours in the neighbourhood. These may further produce a displacement of the organ.

On the other hand, the larynx, or trachea, may be dilated. Rokitansky attributes this condition to relaxation of the posterior wall, in which state hernia of the mucous membrane may occur. The dilatation is also said to result from general atrophy of the tissues, and might therefore be expected to be more frequently found in old age.

#### AFFECTIONS OF MOTILITY.

Besides changes in colour and form, the laryngoscope reveals disturbances of motor power. Affections of this function may be classified in the same manner as those causing change of colour and form. The movements may be either increased or diminished. Interference with the co-ordination of the complex movements required may also take place. Any of these irregularities of action may be due to either direct or indirect causes. The lesions producing them may be situated in the larynx or at a distance. Thus interference with the action of the muscles may take place on the spot, or their innervation may be disturbed. In the latter case the lesion may be in the periphery, in any part of the course of the nerve, or in the central nervous system. Derangements of motor function are therefore of great importance; they often shed light upon diseases affecting the general system, and they deserve the fullest attention

of the laryngoscopist. The student has already watched the movements of the vocal cords and learned their relation to respiration and vocalisation; he is thus prepared to see the significance of any interference with their movements. If the cords cannot approach the median line the voice will be lost. If the power to separate them be impaired the inspiration will be impeded—and that in proportion to the extent to which the dilatation of the glottis is prevented; while inasmuch as vocalisation is dependent on the vibrations of the tense cords, the voice will be changed or lost by any abatement of the power to make them tense or co-ordinate their delicate movements. Now these movements may be impeded by extrinsic circumstances—*e.g.*, swelling of parts around may prevent the approximation or proper vibration of the cords, in which case loss of voice or hoarseness will ensue; ankylosis of the joint of the arytaenoid cartilages has been known to occur: polypi have grown in such positions as to obstruct the closure of the glottis; and other changes brought about by disease may interfere with the movements of the cords. Their function may also be impaired or abolished by intrinsic changes—either myopathic or neuropathic.

The muscles by which the movements of the vocal cords are produced may for our present purpose be grouped as the (*a*) *abductors*, (*b*) *adductors*, and (*c*) *tensors*. As the chink of the glottis is widened by the abductors they are also called the *dilators*, or *openers* of the glottis, while the adductors are the *contractors* or *closers* of that fissure. If the power of



one of these equally-balanced groups be impaired or lost, the other will be to that extent unrestrained, so that deficient power of one may manifest itself in inordinate action of its antagonist. The motility of the vocal cords may be only slightly impaired—paresis; or it may be completely abolished—paralysis. In the same way exaggerated movement may produce only slight symptoms, or it may appear as severe spasm.

*Spasm of the Vocal Cords.*—Spasmodic contraction of the abductors would of course prevent closure of the glottis, but would not interfere with the passage of air. As long as the dilators kept the glottis open the voice must be lost. On the other hand, the effect of spasm of the adductors is to approximate the vocal cords, and so close the glottis. If this closure be complete, respiration is arrested; if incomplete, inspiratory dyspnoea, or stridor ensues. If the spasm be momentary there is only a sudden catch of the breath; if prolonged it may be fatal.

This is the disease commonly called "spasm of the glottis," but to which, as more accurate, I have applied the term spasm of the vocal cords. A series of such spasmodic interruptions to respiration is the key to the seizures that have been described under the terms laryngismus stridulus, false croup, spasmodic croup, cerebral croup, suffocative catarrh, crowing inspiration, child-crowing, thymic asthma, Millar's asthma, Kopp's asthma, and other names. In all these paroxysms we have excessive action of the vocal cords by their muscles being thrown into spasmodic contractions. This may be due to peripheral causes, or to any irritation in any part of the nerve, or to central disease,

just as in the case of paralysis. Moreover, we may divide the irritants into direct and reflex. If now we consider the various ways in which spasm of the cords may occur, and then the extreme liability of children to all convulsive diseases, and of the infantile larynx to take on spasm, we shall be able to understand the difficulties which have been met with in the cases described under such various names, and to appreciate the clinical descriptions which have been handed down to us. But here we should call to mind the important fact that a similar train of symptoms might certainly be produced by paralysis of the dilators of the glottis, which was conjectured by Dr. Ley (*a*) in pre-laryngoscopic times to be the essential cause of the attacks. The phenomena are so characteristic of spasm, that in the majority of cases we must recognise that condition, but paralysis also occurs, though more rarely. The degree of spasm accounts for the symptoms; when complete the breathing is arrested, when incomplete the inspiratory stridor is the leading phenomenon. If momentary only, there is merely the catch in the breath, often observed in the early stage. If prolonged it may destroy life. Generally, the spasm relaxes as soon as insensibility approaches. Though most common as an affection of childhood, spasm may attack adults, but in these paralysis is more frequent.

Inordinate action of the vocal cords is also seen in some spasmodic coughs, and other nervous diseases, but by far the most common cause of spasm is direct irritation, such as the admission of substances into the

(*a*) "A Treatise on Laryngismus Stridulus." London: 1836.

larynx, as in the familiar event of food or drink "going the wrong way." Such an accident at once provokes spasmodic action of the adductors, by which the glottis is closed against the further passage of the intruder.

Among the numerous possible causes of spasm, it has been again suggested by Franz Heller that acid fluid from the stomach may pass through the cardiac orifice, and when the position is favourable reach the larynx. Perhaps this may be admitted as one cause—an occasional one; for we know that the contents of the stomach are easily eructated, besides which, when the patient lies on the side with the head low, fluids easily slip from that viscus along the œsophagus. Dr. Solis Cohen (*a*) suggested that the epiglottis might become impacted, and so cause spasmodic cough and suffocative paroxysms, and he has recorded (*b*) two cases in which sudden incarceration of this valve was found to exist, and on being released the paroxysm subsided. It is obvious that such impaction would arrest respiration as readily as spasm of the vocal cords. In this case, however, laryngeal spasm is not a misnomer, since the epiglottis is supposed to be first drawn down by inordinate action of the aryteno-epiglottidean muscles, and then to become impacted. Impaction of this valve may also occur as a consequence of its partial destruction, the remainder being loosely attached and playing the part of a foreign body. A patient under my care was at times attacked with fits of suffocation, which he was able to relieve by passing

(*a*) "Diseases of the Throat." New York: 1872.

(*b*) *Medical and Surgical Reporter*. Philadelphia: March 16, 1878.



his finger into his throat and hooking up the partially detached epiglottis, which had become fixed.

*Spasmodic cough* affects both children and adults, and is closely allied to the diseases already mentioned and other nervous disorders. Constant, barking, spasmodic, cough may continue for weeks without producing appreciable local effect. Hysterical and nervous laryngeal coughs are recognised by many, and are very intractable. Spasmodic action of the cords is also met with in whooping-cough, and I have observed that anomalous cases of laryngeal spasm seem often to be but the remnants of that disease.

Thus we see that spasm may be slight or severe, endangering life, or causing only trivial inconvenience ; it may recur at frequent intervals, or more rarely ; it may be localised in single muscles, or affect groups of muscles ; it may be provoked by local irritation, or by distant and deep-seated disease.

*Paralysis of the Vocal Cords* is more important still. By means of the mirror we are able to determine what movements are lost, and so to decide which muscles are affected. Thus, in paralysis of the abductors the cords cannot be drawn to the sides of the larynx, so that the opening of the glottis does not enlarge sufficiently during inspiration ; in paralysis of the adductors the opposite condition exists, the glottis being widely dilated, and on attempted vocalisation the cords cannot be brought to meet in the median line. In either of these cases the disease, instead of involving both sides, may be confined to one, when the cord of that side will seem to be incapable of acting, although

the motion of the other is distinctly visible. To distinguish such cases the word bilateral is used when both cords are involved, unilateral when only one is affected. I quite as often content myself with the English words single and double.

Paralysis of the tensors of the vocal cords will not so easily be diagnosed by beginners, but the relation of such a condition to the vocal function is sufficiently obvious to show the part it may play in affections of the voice.

It may be advantageous to add a few details respecting some paralyses.

In double (bilateral) paralysis of abduction the glottic aperture may be seen in the laryngoscope reduced to a mere linear fissure. The *crico-arytænoidei postici*, the only openers of the glottis, having lost their power, the cords are left to the unrestrained action of their antagonists, and the respiration is impeded in proportion to the completeness of the paralysis. The consequence is urgent inspiratory dyspnœa with stridor, especially during sleep. These symptoms usually come on gradually, but are always aggravated by cough or exertion, and suffocative paroxysms are apt to occur. Yet there may be no congestion or inflammation, and the voice may not be affected, as there is no hindrance to vocalisation; but the disease affects the respiration in the gravest manner. The passage for air is in fact reduced in the exact degree in which the cords are not drawn apart. The dyspnœa is entirely inspiratory; expiration is not hindered, and the voice continues nearly or quite natural. At first the cords may only occupy

the position of rest, but they progressively approximate until the glottis is narrowed to a mere linear fissure. The dyspnœa is then necessarily extreme, and the patient in constant danger of asphyxia. The only help for such a case is to perform tracheotomy; it is the respiratory, not the vocal, function which is interfered with, and life is therefore at stake. Happily the disease is rare.

In single paralysis of abduction the action of the sound *crico-arytænoideus* draws its cord quite aside, so that the glottis is dilated sufficiently for quiet respiration; but the paralysed cord remains near the median line, and being thrown into coarse vibrations by forced inspirations, gives rise to loud sounds. Though the dyspnœa and stridor are not so urgent as in the bilateral, or as I propose to call it, double form, on the least exertion they become very distressing, and various constitutional symptoms will arise in the course of the disease. This paralysis is generally dependent on distant lesions, but it may be produced by local injury, and even by catarrhal inflammation.

In double paralysis of adduction, the closers of the glottis (the *crico-arytænoidei laterales*, *thyro-arytænoidei externi et interni*, *arytænoideus*) being disabled, the respiration is free enough, but as the cords cannot be brought into position there is aphonia. This is a very common affection, is frequently associated with hysteria and various nervous disorders, and spoken of as functional, hysterical, or nervous aphonia. It should not, however, be forgotten that the same paralysis may be produced by organic causes. It may be caused by congestion and inflammation,



and linger after these have passed by. It may also follow local injury. It is common in anæmia. It frequently occurs in phthisis, and should be distinguished from the effect of the organic lesions so often met with in that disease. It is sometimes of rheumatic origin. Plumbism is another cause. I have also traced it to malarial influence. Central nerve lesions may also give rise to it, but this is rare.

In single paralysis of this kind the respiration is free, but phonation is affected because the paralysed cord cannot be brought to meet its fellow. The voice is not, however, necessarily lost in this single paralysis, for increased action on the healthy side to some extent compensates for the loss of power on the other. Thus we see in the laryngoscope that on phonation the healthy cord is carried beyond the median line towards the opposite side. In this way the cornicula laryngis sometimes actually cross each other, and the glottis looks oblique. The degree to which the voice is affected depends on the amount of interference with the normal movements. The disease is usually more important in respect to the voice than otherwise ; but if there be paralysis of any other part, or any sign of central nerve disease, the case assumes a more serious aspect. It may be set up by catarrh, by syphilis, by chronic metallic poisoning, and by overstraining of the voice.

The tensors of the cords are the *crico-thyroidei* and the *thyro-arytænoides interni*, assisted by the *crico-arytænoides*, which fix the arytenoid cartilages posteriorly. The effect of paralysis of these muscles will now be understood.

The *thyro-arytænoidei interni* are more frequently paralysed than perhaps any of the muscles of the larynx. We then see the glottis, on attempted vocalisation, as an oval instead of a straight opening, bounded on each side by a curved instead of a straight edge to the vocal cords. If only one cord be affected its edge will be semilunar, while that of its fellow remains straight. The *arytænoideus* is often at the same time paralysed when the vocal processes occupy their usual position, and the cords form one opening in front of them and another behind. Occasionally, the *arytænoideus* alone is paralysed, when we see that the inter-ligamentous glottis closes on vocalisation, but the inter-cartilaginous part presents a triangular opening through which the air escapes. The voice will be more or less affected in these latter cases according to the degree of the paralysis and the nature of the lesion which has produced it.

As the laryngeal muscles, except the *crico-thyroidei* are supplied by the inferior, or recurrent, paralysis arising from a lesion of that nerve is evinced by immobility of the cords which are fixed midway between the median line and the position of inspiration, as they are seen after death, and now commonly named the *cadaveric* position. There is aphonia, but not dyspnœa.

Paralysis in the region supplied by the superior laryngeal nerve may affect the *crico-thyroidei* and the depressors of the epiglottis (*thyro-epiglottidei et ary-tæno-epiglottidei*) and is necessarily associated with neurosis of sensation.

A few years ago, Dr. Elsberg pointed out a differ-

ence between the *cadaveric* position—the one which is quite uninfluenced by muscular action—and that which results when all muscles are paralysed, except those supplied by the superior laryngeal nerves. In this latter case he found the edges of the cords slightly concave, while in the dead body they are straight, as they also are in paralysis involving the crico-thyroid, thyro-arytænoid, arytænoid and lateral crico-arytænoid, either with or without the posterior crico-arytænoid muscles. As this observation somewhat lacks confirmation, he has again called attention to it.

Affections of motility do not always present the typical features we have described. There may be a combination of laryngeal spasm and paralysis—of excessive action of one muscle or group, with loss of power in another. So, too, as the reader will probably have anticipated, we may meet with paralysis of a group or single muscle in combination with the like condition in some other group, so that the laryngoscopic appearance may be a complex one, resulting from the particular combination, and sometimes by no means easy to analyse.

One word of warning. It may be easy to see that paralysis exists, but most difficult to determine the lesion which gives rise to it. The course of the inferior recurrent renders it liable to be affected by aneurisms of the arch of the aorta on the left side, of the innominate or subclavian on the right, by cancer of the œsophagus, tumours in the anterior mediastinum, induration at the apex of the right lung, bronchocele or any tumour or injury in the course of the sympathetic. Finally, central nerve disease within the



cranium must not be forgotten. Able observers have failed to detect lesions of this kind, which have afterwards become manifest, so that the student may well hesitate before the problems which sometimes surround the subject of laryngeal paralysis.

As we are here studying only the conditions revealed by the laryngoscope, I have not dwelt on general symptoms, but I think it sufficient to warn the reader that they are not to be forgotten. He will be but a sorry laryngoscopist who is a mere specialist, for the instrument is capable of rendering the greatest services to many branches of our art.

#### STAMMERING OF THE VOCAL CORDS.

Under the title of "A Hitherto Undescribed Laryngeal Affection," I submitted to the annual meeting of the British Medical Association, 1879, a brief description of a disease which seems to be due to a defect in the power of co-ordinating the intrinsic muscles of the larynx, and which I proposed to call vocal stammering, or stammering of the vocal cords. In this disease the vocal apparatus fails at intervals to properly carry out the behests of the will, giving rise to sudden interruptions to the voice, while the articulating power may be unaffected. As in the generally recognised impediments of speech, the harmonious action of the groups of muscles engaged in articulation is disturbed; so in the vocal derangement I have discovered there is an analogous laryngeal motor disturbance. The disordered co-ordination which so commonly interferes with the utterance of syllables may disturb the pro-

duction of voice only. Thus we see the movements required for producing syllables perfectly performed, while the vocal sound is at intervals suddenly arrested. There is an intermittent momentary voiceless condition. This may cause the patient to stop speaking, or he may continue a sentence from which some words are lost to the listener. A clergyman suffering from this disease in an aggravated degree was exceedingly distressed by his consciousness of the fact that though he kept on reading the service, some of the words dropped soundless from him, and his friends watched his lips moving in the usual way when words and phrases were lost in silence.

The sudden interruption of the function of the vocal cords in such cases is most difficult to demonstrate; it is very unlikely to occur during the utterance of such sounds as are usually emitted in laryngoscopic examinations. I had to watch for a long period and to devise special methods before obtaining ocular demonstration of this stammering of the vocal cords. Isolated sounds in the most confirmed stammerers may be correctly articulated; so also in these vocal impediments the patient can emit separate tones, and may even run up and down the gamut with ease. But now and then with certain combined sounds rapidly produced in succession, a sudden hesitation or temporary arrest of the laryngeal movements will occur. The vocal cords hesitate or tremble for an instant at a point not sufficiently approximated for vocalisation, where they move as with a series of ineffectual efforts to obey the will or display the paroxysmal spasmodic or irregular actions seen in the mouths of confirmed

stammerers, or the less distinct interferences with utterance called "hesitation of speech." In fact, most of the derangements commonly grouped under the expressive term impediments of speech may henceforth be said to have their counterparts in similar vocal impediments occurring within the larynx.

These and other nervous affections may prove a heavy burden to persons with whose occupation they do not interfere, while they may altogether suspend the work of clergymen, barristers, singers, and others who make a professional use of the voice.

#### SENSORY NEUROSES.

These affections may be arranged in the same way as the preceding neuroses. We may have increased, decreased, or perverted sensibility. Anæsthesia, hyperæsthesia, neuralgia, and paræsthesia are met with affecting the larynx and pharynx. I have long recognised these conditions, and recently they have received more attention. Diminution and abolition of sensation in the throat is known as a sign of approaching death, as well as of diphtherial paralysis. I have found distinct laryngeal anæsthesia in the latter as well as in labio-glosso-pharyngeal paralysis, and although this has only lately been generally admitted, von Ziemssen, Chairou, Schnitzler, and others have reported cases. The same condition accompanies some other nervous affections, and lately we have learned that we can, at will, produce complete, if temporary, local anæsthesia, without inconvenience, by means of the salts of cucain.

Neuralgia of the larynx is not very frequent, and



moderate degrees of hyperæsthesia are difficult to appreciate in consequence of the great range of normal sensibility in different persons. Nevertheless, I have had cases which were unmistakeable. Dr. Clinton Wagner has recorded an interesting case (*New York Medical Record*, 1875).

The spasmodic cough alluded to above would seem to be associated with hyperæsthesia, if not dependent upon it, in connection, perhaps, with increased reflex irritability.

Not only the degree of sensibility, but the kind, may also be discriminated. Prof. Elsberg, who has paid much attention to the subject, distinguishes them as: 1. Tactile, by which temperature and pressure are appreciated; 2. Dolorous, by which pain is appreciated; 3. Reflex, from which result muscular contractions, as well as intravascular and secretory phenomena. These divisions may seem sufficient, but I am accustomed to distinguish between the impressions of touch and temperature, and therefore divide the first class into two, viz.—tactile and thermal. I have sometimes found the tactile diminished or abolished when the thermal remained unimpaired.

At the International Medical Congress (1881) a classification of laryngeal neuroses was offered by Dr. Elsberg, which he has again quite lately brought forward (*Phil. Med. Times*, Oct. 18, 1884) in a somewhat extended form, as seen in the following table. While quoting this I would remind the reader that in many cases some of the various conditions are sometimes curiously combined, or exist on opposite sides of the larynx.

## PROF. ELSBERG'S TABULAR VIEW OF NEUROSES.

I. Hypæsthesia.	{ 1. Anæsthesia.		
	{ 2. Analgesia (Analgia, Anodynia).		
	{ 3. Anæsthesia dolorosa.		
	{ 4. Tactile hypæsthesia and hypalgia.		
	{ 5. Reflex hypæsthesia.		
II. Hyperæsthesia.	{ 1. Tactile hyperæsthesia.		
	{ 2. Hyperalgia (algæsia, hyperalgæsia).	{ Spontaneous.	
		{ From external impression.	
	{ 3. Reflex hyperæsthesia.	{ Muscular effects.	
		{ Circulatory effects.	
		{ Secretory effects.	
		{ Peripheral.	
		{ In nerve-trunk, or neuralgia.	
		{ Cough, choking, spasm, etc.	
		{ Flushing, paling.	
		{ Constant Paroxysmal, or true neuralgia.	

The perversions of sensibility are so various that it is impossible to classify them or to enumerate them all. There are, however, perversions of tactile, of dolorous, and of reflex sensibility. Among the first mentioned, the most frequent are the sensation of heat or burning (the opposite—a sense of coldness—is very rare, but I have also seen that) and the sensation of the touch of a foreign body, attention being given mainly to its shape and its weight or pressure. Patients describe all possible and impossible shapes and materials in endeavouring to give an account of the perverted sensations. I have sometimes thought most of them might be arranged under the three heads,—1. sphæræsthesia; 2. zonæsthesia, or strangulæsthesia; and 3. akanthæsthesia; comprising, under the first, the sensation of a bulky body, generally ball-shaped; under the second, a cincture or band feeling, a sense of constriction; and under the third, the sensation of a sharp-pointed body, piercing or cutting.

## III. Paræsthesia

## XI.

### LARYNGOSCOPAL THERAPEUTICS.

Principles of General Therapeutics applicable to the Treatment of Diseases of the Throat. Laryngoscopic Therapeutics, or Use of the Laryngoscope as a Guide to the Hand in making Topical Applications. Liquid Applications. Laryngeal Brushes. Probangs. Holders. Sizes and Forms of Brushes. Effects of their Introduction. Occasional Distressing Symptoms—their Relief. The Liquids used—Anæsthetics, Sedatives, Astringents, &c. Vehicles. Laryngeal Syringes—Comparison between them and Brushes—Effects dependent on the Force employed.—Laryngeal Shower Bath or Douche. The Drop-Tube. The Pipette. Solid Applications. Powders. Insufflators. Effects and Uses of Powders—Astringent, Sedative, &c.

IT is obvious that an instrument capable of bringing the interior of the larynx within the range of vision, must serve as a sure guide to the treatment of its diseases. In the laryngoscope not only can we study the physiology of the larynx and detect deviations from its normal form, colour, or movements, but we may also watch the development and progress of such changes—that is to say, the natural course of disease, and bring to bear on the part affected such remedies as may restore it to health. By the mirror we can



guide the hand so as to enable us to make topical applications and perform operations within the larynx, and it is to such local treatment that the term laryngoscopic therapeutics is mostly restricted. There are, however, certain other remedies which cannot be omitted from a manual like this, as they are most valuable adjuvants to the other procedures, may, indeed, often be substituted for them, and are of still greater value in cases in which other parts than the larynx are involved. Such are gargles, fumigations, inhalations, &c. Moreover, local measures must not be allowed entirely to supersede general treatment. In the pre-laryngoscopic period physicians were deprived of the opportunity of applying to the larynx remedies they were accustomed to use in diseases of other organs, and thus their treatment was naturally as defective as their diagnosis was obscure and difficult. Now, however, the reverse condition obtains, and the principles of general therapeutics are apt to be forgotten, while the larynx is often subjected to an amount of local treatment that would be considered excessive in other organs. Success as a laryngoscopist is not to be obtained by devoting exclusive attention to a single organ, as though that were not after all but a small part of the body. The aim of the physician is to cure, or if that be impossible, to relieve his patients; and this can only be attained by a careful study of all the conditions, many of which relate to the general health rather than to slight deviations from the natural condition of a single part.

Having put in this plea for general therapeutics, it will be unnecessary to dwell upon the application of

the principles involved, and I pass to a consideration of remedies of a more special character.

The term laryngoscopic therapeutics implies the use of the laryngoscope to guide the hand in the application of local remedies or the performance of operations. It therefore comprises—

*a.* The employment of all such measures within the cavity of the larynx itself.

*b.* Topical treatment of the posterior nares, which may be distinguished when necessary as rhinoscopical or rhinal therapeutics.

*c.* Similar procedures in the fauces, for though here we dispense with the plane mirror, the concave reflector is the most convenient instrument for illuminating the parts.

The student who has learned the use of the mirror and educated both his hands in the manner previously described, will not find much difficulty in introducing into the larynx an ordinary laryngeal brush.

Simple, however, as this operation seems, it requires care and dexterity, and gives rise to disagreeable effects. Before performing it the beginner should acquire dexterity in illuminating and making applications to the fauces in cases requiring it. For faucial application a probang is sometimes employed and there are cases in which this instrument may be preferred, though the brush may be made to serve almost all purposes. Brushes should be well made and of assorted sizes, and the physician will require a number in proportion to the extent of his practice in the department. They may be mounted on aluminium wire, which has the double advantage of being easily

bent, and not readily affected by the liquids usually employed. The angle in Fig. 39 is constantly sold, but is only fit for use in the fauces or nares. Those intended to enter the larynx should be curved round until the point is at a right angle with the stem (Fig. 41). The angle may be rather acute, or the sweep may be more like that of a cathe-

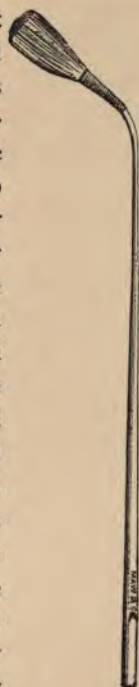


FIG. 39.

ter. It is well for the handles to be of the same size, and not less than eight inches in length. When the aluminium wire is employed, one or two inches of that substance may be included in this measurement, which is taken from the end to the angle; thus the horizontal part of the instrument is eight inches in length—

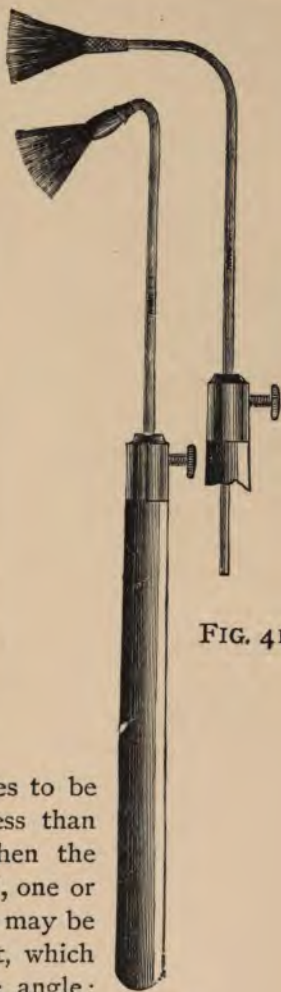


FIG. 40.

FIG. 41.



six or seven for the handle—wood or ebony—and one or two, as the case may be, for the wire. The length of the perpendicular part is of more importance. For an adult it should never be less than two inches from the angle to the end of the camel-hair brush. Two and a-half and three inches are more frequently required.

The use of these brushes is to apply fluids to the diseased mucous membrane, a mode of treatment which the laryngoscope enables us to carry out with precision, and than which none is more efficacious.

The readiness with which the larynx resists the intrusion of foreign bodies is so well known that surprise is often expressed at the little distress occasioned by this mode of treatment when skilfully carried out. Unpleasant symptoms are, in fact, the exception rather than the rule. Indeed, visitors to the hospital sometimes remark that after watching several persons during the whole afternoon, making applications to the larynx by the brushes, they have not seen a case in which disagreeable effects followed. This may depend on several circumstances. Thus, in a hospital many of the cases have been under treatment for some time and become accustomed to it; and it is one of the most important facts that we may train very sensitive persons until the larynx easily tolerates the constant use of instruments. It is to such training that we sometimes resort to prepare for operative proceedings within the larynx. In some diseases the sensibility of the larynx appears diminished. Besides these circumstances there can be no doubt that to take the larynx by surprise, as it were, and brush it with that

degree of firmness which characterises the skilled hand is far less likely to cause spasm or distress than is the sudden intrusion of a small body, like a crumb or a drop of water, which so frequently, when it "goes the wrong way," gives rise to spasmodic efforts to eject it.

Still, even in the most skilled hands the brush may occasionally set up a choking sensation, a degree of irritation or pain, a contraction of the vestibule, and even a true spasm of the vocal cords. Such symptoms are, however, very transient, as is also the change in the voice, that may surprise the patient. They give rise to alarm in the mind of the sufferer, who, if not forewarned, should be at once assured that there is no danger, and, if possible, induced to speak. The utterance of a single word gives complete relief. This, however, may be difficult, and the best plan is to hold the breath a moment or two, and then utter a single syllable, as "oh!" or "ah!" when the spasm will at once subside.

The effects of the mechanical contact of the instrument being temporary, we have next to consider those of the liquid with which the brush is charged. These differ with the nature of the fluid, which may be stimulant, astringent, sedative, &c. The selection of the liquid will be made in accordance with the principles that guide us in the local treatment of other diseased mucous surfaces, modified only by the conditions that are special to the organ under consideration. The effects of various substances on mucous membrane, especially on that of the respiratory tract, has long been with me a favourite study, and some of my observations on the action of remedies on the lining of the upper air passages are

embodied in a work on "Respiratory Therapeutics" (a) which is being published in America simultaneously with the present edition of this lesser manual.

*Astringents.*—Solution of perchloride of iron is invaluable, and may be used in various proportions, from a few grains up to one or two drachms to the ounce. Iron alum and ordinary alum may likewise be used in a solution of 20 to 60 grains per ounce. Of zinc the chloride is the most efficient salt, and its strength may vary from 10 to 30 grains. The sulphate is, however, also useful, 40 to 60 grains being dissolved per ounce, and the acetate, 15 to 30. Chloride of aluminium is a powerful astringent, and may be used in this way as well as by other modes; so too, may many other substances, including tannin and most astringents.

*Alterants.*—Iodine is much relied on by some; the tincture diluted with glycerine; or a solution in that liquid of various strengths may often be advantageously employed.

Solutions of silver nitrate were among the earliest employed, and in suitable cases are of great value. Some writers think this substance the most liable of all to give rise to spasm, and for that reason have nearly discarded it. Others do not accept this doctrine. The fact is, that the effects of this remedy differ much with the strength of the solution. I have used it from two grains in the ounce to 120; and though other remedies may often be advantageously preferred, I cannot look upon it as a simple astringent or consent to altogether deprive my patients of the benefits of its remarkable properties.

(a) In Wood's "Library of Standard Medical Authors."



As *solvents* of false membrane, lactic acid and lime water have obtained considerable repute.

*Antiseptics.*—Of carbolic acid, from 10 to 30 grains of the crystals per ounce may be employed. The sulpho-carbolates may also be referred to as possessing valuable properties. Sulphurous acid may be used more concentrated than is commonly supposed. Other antiseptics and astringents I have also found useful.

As *sedatives*, solutions of bromides, of morphia, and other alkaloids are used.

*Anæsthetics.*—The recent discovery that cucain, the active principle of cuca or coca erythroxylon, produces local anæsthesia is of the highest importance. A weak solution of the muriate of cucain (2 or 4 per cent.) is often sufficient, but sometimes much stronger solutions may be requisite. It depends somewhat on the degree of anæsthesia required, and the depth to which it is desired the influence should extend. It is only necessary to paint the part from one to three times, at intervals of three to five minutes, when local anæsthesia is produced, lasting from fifteen to thirty minutes. Operations can then be performed. In intra-laryngeal operations of importance, such as the removal of growths, the value of such an agent is apparent. For this purpose, however, it may be necessary to employ a 10 or even 20 per cent. solution. But apart from such uses the alkaloid is of great value. It arrests and sometimes cures hyperæsthesia and neuralgia. The dysphagia which is sometimes so distressing in laryngeal phthisis may be controlled by cucain. Further, this remedy acts in a striking manner on the circulation where it is applied.

It at once produces pallor, and a part may be completely blanched by it. In health, this effect may last some time, and then be repeated. So in disease it may be resorted to in order to remove congestion. I have obtained remarkable results with cucaïn as a remedy in various diseases, as well as great assistance in difficult intra-laryngeal operations. A weak solution may be used in the form of spray, care being taken that the spray reaches the part required, and is not wasted over a large surface. This remedy may be applied to the larynx, pharynx, nares, or mouth. Indeed it has been already shown to be a very useful anæsthetic to all mucous surfaces.

The solutions may be made in simple distilled water, or a portion of glycerine may be added. It has been proposed to use the latter only as a solvent, but this is not desirable, as it is an irritating fluid, glycerine being far from the bland liquid it is frequently called. When mixed with water, however, it loses its irritant quality, and the consistence of the liquid is increased. Its slowness to evaporate may also be regarded as some advantage.

For making applications to the interior of the larynx the superiority of well-made brushes to probangs is incontestable. There may occasionally be reasons for preferring the sponge, but then the probang should be of the proper shape, as Fig. 42, those usually sold being only fit for application to the fauces and pharynx. It is the unsuitable form of these probangs that has led to their disuse.

Holders for carrying pieces of sponge or cotton wool into the larynx have been constructed, but the

possibility of the armature becoming detached renders them less safe than the brushes or probangs. Their use should therefore be confined to the fauces, where straight ones (Fig. 43) are useful.

Medicated liquids are sometimes injected into the larynx by means of a syringe. It is obvious that with the aid of the mirror there could be no more difficulty about this than about other instruments, provided the pipe of the syringe be of sufficient length and of a proper curve.

Most syringes are much too large. It is not necessary for the instrument to hold much. A piece of sponge may be introduced into a large syringe in order to diminish its capacity and modify the force with which its contents are ejected on

pressing the piston; but it is more convenient to use a smaller syringe than that shown in Fig. 44, which, though useful for other purposes, is not suitable for the larynx. The nozzle should be perforated with a number of small holes, in order that the liquid may be distributed in the laryngeal cavity in several streams. This is nearly the form first used by Tobold, but the curve is too slight. It should not be less than for other laryngeal instruments.

The next engraving (Fig. 45) shows a laryngeal syringe made according to my directions.

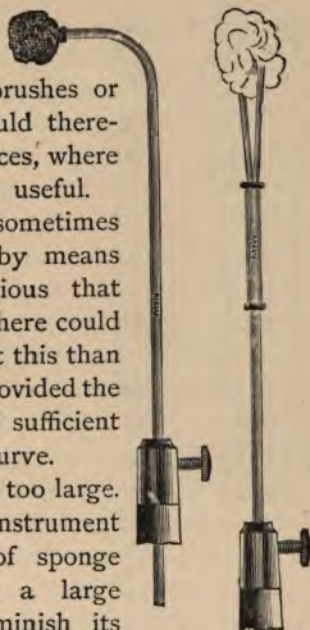


FIG. 42 FIG. 43.





FIG. 44.



FIG. 45.



FIG. 46

In Gibb's laryngeal douche a perforated pipe is furnished with a caoutchouc ball. By compressing this the air is expelled, and any liquid into which the end is dipped will enter on the pressure being removed. When thus charged it can be used for the

same purposes as a syringe. This instrument is much improved by the addition of a pair of rings, as shown in Fig. 46, and the use of

which in facilitating the application is apparent from the engraving.

The mode of injecting fluids into the larynx by any of the preceding instruments requires no detailed observations. The only requirements on the part of the operator are steadiness and dexterity. The laryngoscope must always be employed. Holding the mirror in his left hand, the operator, guided by sight, introduces the end of the syringe into the larynx in just the same way as a brush, sound, or other instrument, completing the operation by pressing his thumb on the piston with that degree of force he desires to employ.

This brings us to consider the special action of injections. Sudden and forcible pressure evidently projects a douche on the walls of the larynx, while the feeblest possible compression will only cause a few drops to exude from the tiny apertures, and collect into one, which falls into the cavity. Between these two extremes there are many degrees of pressure, and the effects will vary accordingly. Unless we intend to use sufficient force to drive the fluid as far as the walls of the larynx, there is no advantage in having the end of the syringe furnished with numerous tiny perforations to break up the stream. If we use sufficient force to project the fluid on the membrane, clearly we administer a sort of shower-bath to the larynx, and the influence of this ought not to be overlooked. There is another difference between the use of syringes and brushes. In using the latter we touch the mucous membrane with a foreign body, and this has been urged against their employment. I have,

however, shown that very little irritation is caused by the skilful use of well-made brushes. On the other hand, injections are in reality far more distressing. Whether a powerful douche be projected into the larynx or only a drop or two slowly injected, violent spasm is very liable to be caused. In the former case many would naturally anticipate this result; but in the latter it is quite as frequent, and sometimes more severe. Part of the effect may be due to the shock of the stream on the walls of the larynx; but when only a drop or two is injected, we have just the inconvenience that is set up when in drinking or gargling, liquid is drawn into the air tube by inspiration. Every one knows that if a single drop "go the wrong way," the dyspnœa, cough, and spasm may be extremely distressing. The best way to relieve these symptoms is to "hold the breath" resolutely for a few seconds and then speak. Patting on the back, drinking a drop of water, and speaking are also advised. Drinking is a relief when the spasm abates, but cannot be tried until then. The utterance of a single syllable will often suffice to restore respiration.

A consideration of the little accidents alluded to seems to show that the smallest drop of liquid approaching the cords immediately provokes them to close the glottis; and the tendency of this orifice is to remain shut until the fluid has disappeared from the surface of the cords by becoming diffused throughout the cavity. If the respiration could be easily suspended, this would soon be accomplished in the case of a small quantity; hence the use of the direction to hold the breath. Moreover, the disposition to spasm



is exhausted by the contact of the fluid. When the liquid passes by surprise below the glottis, the cough set up is more violent still. Hence it is a common plan to direct a patient to expire during the injection, or better still, to utter a falsetto note.

From what I have stated, the reader will be able to draw his own conclusions as to the relative value of brushes and syringes. In making his estimate he must not forget that by means of the former it is possible to localise the application to a portion of the larynx. This cannot be done so well with the syringe, though it may with care be accomplished when only just enough pressure is used to let a drop of the contents ooze through and collect at the end. For such a purpose, however, the drop-tube (Fig. 47) is more



FIG. 47.

appropriate. In this instrument, at a convenient position to apply the forefinger, there is a reservoir *a*, which is covered by a thin elastic plate. By pressure on this when the point of the tube is submerged in the liquid, the reservoir is easily charged. The tube being introduced by the aid of the mirror, and the finger gently pressed on the elastic plate, the liquid is exuded drop by drop, the operator all the time

retaining complete control over the quantity thus instilled into the larynx. I have adopted the principle of the pipette for instilling fluids, drop by drop, into the larynx, and this is a more simple plan than even the drop-tube. The patient should emit a high note during the operation. If through a sudden inspiration, or from the cords being allowed to remain open, and being taken by surprise, a drop of liquid should pass the glottis, a violent paroxysm of cough and dyspnœa may at once supervene, just as in the other cases in which the same symptoms have been mentioned as likely to occur. For this and other reasons I employ brushes much more frequently than syringes, the drop-tubes or pipettes.

Instead of liquids we may apply solid remedies within the larynx. The use of caustics will be considered further on. Here I desire to point out that solid remedies reduced to the form of an impalpable powder may be introduced into the larynx with as much benefit as frequently follows their use in the pharynx. Such applications have been made in various ways. Thus patients have been placed in an atmosphere in which the powder was diffused, others have been taught to draw the remedy into the larynx by a deep sudden inspiration. These processes, however, belong to another branch of the inquiry. At present we are concerned with laryngoscopic therapeutics, or the art of applying remedies by the aid of the laryngoscope. For the purpose of thus applying powders we employ an insufflator, which is an instrument for projecting the fine powder by a puff of air. In the ordinary insufflator of Rauchfuss this is accomplished by means

of an india-rubber ball, pressure on which forces out the powder. It is, in fact, only an adaptation of the douche. The difficulty of holding the tube in position while suddenly compressing the ball has led some to resort to other means of blowing out the powder. They have accordingly substituted for the elastic ball used by Rauchfuss a long piece of india-rubber tube, with an ivory mouth-piece. This enables the operator to project the powder at the right moment by a puff from his own mouth; for it is to be observed that both his hands are engaged, one holding the mirror, the other the insufflator. Many naturally object to blow from their own mouth in this manner. They employ, therefore, a longer tube and a larger hand-ball, which they trust to an assistant, who compresses at a signal from the operator. The objection to this method is manifest. The tube may be attached to a pair of bellows, which may be placed between the operator's knees, or better still, under one foot, which soon becomes educated to the work. In hospital practice this is a convenient plan.

The engravings of the insufflators given show the opening for introducing the powder, and the slide which covers the aperture when the instrument is charged.

Schroetter uses a glass tube in the shape of the ordinary insufflator as far as the junction of the elastic tube, but there he prolongs the glass and turns it to the side at an obtuse angle (Fig. 48). That gives it, as it were, a handle, and keeps the hand while holding it quite out of the way. An elastic tube completes the apparatus. I have had tubes of this shape made of



vulcanite instead of glass. I have also had the openings so arranged as to enable the operator to localise the application to any part of the larynx. This I accomplished by having several tubes (A to E), each of which differs from its fellow in the position and shape

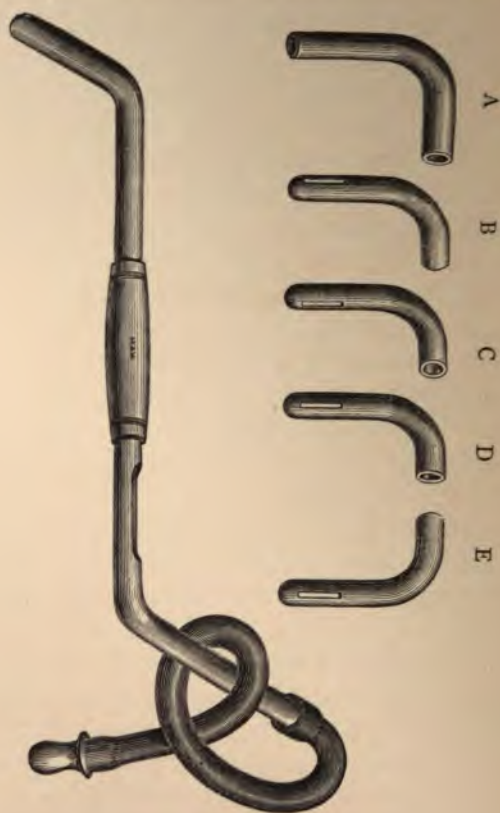


FIG. 48.

of the opening. The most useful forms are three—one with the usual termination, one with a slit on the right side, and a third with a slit on the left side. Two others, one with anterior and posterior openings respectively, may also be had.

Dr. Lefferts has designed an insufflator (Fig. 49) with the caoutchouc ball in a position four and a-half inches from the end, so as to be easily compressed by the operator's index finger. The stem on this side of the ball is solid, affording firm support, so that the instrument, though lighter and of smaller calibre than that of Rauchfuss, can be used with greater steadiness.



FIG. 49.

The idea of injecting a cloud of fine powder into the larynx will to some persons suggest a violent paroxysm of cough as the immediate result. They imagine, perhaps, that a solid, however finely powdered, must be more irritating than a liquid, and it may be that this notion has tended to restrict the use of these remedies.

In suitable cases powders are not more irritating than many solutions in common use. Indeed, sedatives and anodynes are specially useful for insufflation. In the first edition of this little work I ventured to put in a plea for their more extended

use, since which they have been more frequently resorted to.

The effects produced by a cloud of dust falling on the mucous membrane will differ with the nature of the particles of which the dust is composed. An insoluble powder thus applied to healthy membrane provokes some irritation and an increase of secretion. The mucus thus thrown out envelopes it, and the whole is soon expectorated. If the powder fall on the cords more irritation and spasmodic cough are caused. Soluble powders will dissolve in the secretion, and running down the walls of the cavity, may cause cough at a later period, that is, on arriving at the glottis. Whether soluble or not, the powders may be astringent, sedative, stimulant, &c. And some influence is in every case to be attributed to the shock caused by the impact of the particles on the parts. The powders most frequently employed are sedative, narcotic, or anodyne, and the salts of morphia are usually selected for the purpose. Among astringents are tannin, gallic acid, acetate of lead, sulphate of zinc, &c. Nitrate of bismuth, oxide of zinc, and other powders have also been employed. Nitrate of silver has sometimes been used in this way, but I do not recommend it. Iodoform is a very valuable application, and may be used in combination with other powders. It should be reduced to an impalpable powder, or it will irritate.

To regulate the strength of these remedies, we mix them with indifferent powders. Loaf sugar has been freely used, but sugar of milk is better. Some prefer starch. Phosphate of lime has been also used. Talc



is an excellent substance. In regard to astringents, their action may be diminished to any extent by increasing the quantity of the sugar of milk or talc. Morphia may become to some extent absorbed, and so act as a general narcotic. The quantity used is generally small. As little as two to four grains to the ounce has been found useful in some cases in which it has been frequently applied, but I usually employ it in larger quantities at longer intervals. A tenth, eighth, quarter, third, or half a grain or more, pure or mixed with another powder, may be insufflated at a time according to circumstances. The use of this remedy often proves a source of great comfort in advanced laryngeal phthisis, and other diseases. Moreover, we may combine astringents with morphia in any proportion. Evidently, then, there is a considerable sphere in which powders may be employed in the larynx, and it seems needless to add that this sphere is rendered much greater by the admirable results obtained from these remedies in diseases of the fauces, in which they can be applied without the laryngoscope.

## XII.

### LARYNGOSCOPAL OPERATIONS.

Application of Solid Caustics within the Larynx. Probes and Sounds. Caustic Holders. Effects of Caustics on Mucous Membranes generally. Effects within the Larynx. Inconveniences. The Various Caustics. Their Uses—to Destroy Tissues, to Modify Action. Scarifying. Laryngeal Lancets. Œdema. Abscess. Interstitial Injection. Electrolysis. Galvano-Cautery. Faradisation. Catheterism. Removal of Growths.

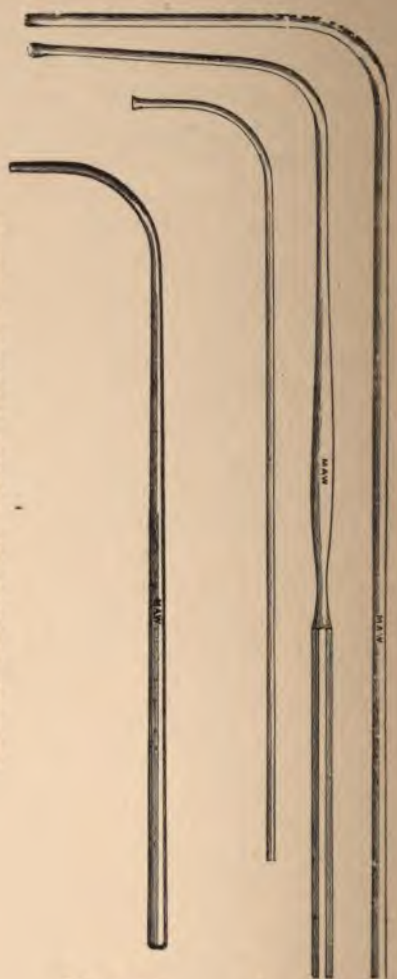
THE resources of laryngoscopic therapeutics have not yet been exhausted. Not only may we apply liquids or powders to the interior of the larynx by the methods previously described, but we may by the aid of the mirror apply solid caustics to small and defined portions of that organ. Nitrate of silver is the most frequently used substance of the kind, and was the first ever employed for the purpose. Various forms of caustic-holders have been designed for the purpose of facilitating the procedure. Most of them conceal the caustic until the instrument is introduced to the spot to be cauterised, when it is propelled forwards by pressure on a spring; on removal of the pressure the caustic retreats within the sheath. Such a contrivance

will give confidence to the beginner, and is constantly used by some laryngoscopists. I have, however, abandoned it in favour of the more simple naked conductor. It is desirable for everyone who intends to practise laryngoscopic manipulations of an operative kind to be able to apply caustic to minute portions of the laryngeal surface. Indeed, this procedure should be looked upon in the light of a surgical operation. For this reason I did not consider it when treating of the employment of solid remedies by means of the insufflator, but reserved it as an introduction to the subject of operations within the larynx.

Before attempting to apply solid caustics or perform other operations the pupil should practise the introduction of the laryngeal sound or probe (Figs. 50 to 53). When, guided by the mirror, he can carry the point of this instrument straight to any spot he desires to touch, he can proceed to more important operations. The sound sometimes gives useful information as to the sensibility of the membrane, the degree of destruction that has taken place, the exact seat, extent, or density of the neoplasms, &c. It is also frequently used to train the larynx to tolerate the presence of instruments. It may be made of steel or of copper wire silvered or covered with gum elastic, and the point may be of various shapes. The handle may with advantage be of the same shape as for other laryngeal instruments. An ordinary metallic sound or an elastic bougie bent to a suitable curve may be made to serve some purposes. For the pupil's practice the gum bougie has an obvious advantage.

One of the simplest caustic-holders is Tobold's,





SIMPLE LARYNGEAL SOUNDS AND CAUSTIC HOLDERS.

FIG. 50. Silver or aluminium. Smooth pointed.

51. Author's—made of a single piece of steel throughout, and plated.

52. Aluminium wire, with Tobold's rough bulb.

53. Flexible silver probe or sound.

FIGS. 53.

52.

51.

50.

Fig. 52) which is only a laryngeal probe or sound, with the bulbous extremity rather large and roughened. A similar one may be made on the plan of the laryngeal brushes already described. It consists of a handle of the same shape and size, mounted with aluminium wire of the same form ; but the wire terminates in a rough bulb, instead of having a camel-hair brush affixed. The nitrate of silver is fused in a small crucible, and the rough bulbous end of the aluminium wire dipped in. The bulb is thus covered with a thin coating of the caustic, and the instrument is ready for use. Twenty or thirty holders may in this way be charged in a few minutes at a cost of a few grains of the silver salt, and they can be kept ready for use. The bulbous extremity is by no means a necessity. In fact, the size of the bulb is rather an inconvenience for the more delicate touches. I therefore often dispense with it, employing the wire, either silver or aluminium, without an expanded end. Nor is it necessary to roughen the point if due care be taken in charging the instrument. A brush from which the pencil has been removed, or the camel-hair of which is worn out, may be made to do duty, though sometimes in these the wire may be found inconveniently short. Instead of the bulb at the end, we may have depressions hollowed out on either side, into which the fused nitrate may be run ; and other variations in the form of this simple instrument are occasionally serviceable. Besides only coating one side of the instrument, we may secure still further protection by covering the other with a paste containing some sodium chloride. Should then some of the nitrate left on one cord come into contact with

the other, it will be decomposed by the salt that is left upon the sound cord, and the silver chloride will produce no effect. One of the greatest advantages of this simple instrument is, that it is impossible for a piece of caustic to break off and drop into the larynx—an accident that may occur with some of the more complicated holders. The holder should be thoroughly cleansed and recharged after each occasion on which it has been used. It can easily be heated over the lamp as soon as it has been used, and can then be left in water until it can be attended to.

The effects of nitrate of silver on mucous surfaces generally are familiar to all practitioners. In the larynx it may produce the inconvenient symptoms already described as sometimes supervening in the application of liquids. Great care should be exercised to confine its effects to the parts on which it is desired to act. It should be remembered that, on becoming dissolved, the solution naturally spreads somewhat on the surface of the membrane. Moreover, the movements of the larynx itself tend to increase this liability. It is often very desirable that the action of the caustic should be particularly limited. In such cases, if unusual sensitiveness exist, it may be desirable to train the patient in the same way as for still more delicate operations, or we may use cucaïn.

Sometimes the slighter effects of nitrate of silver are easy to obtain when the deeper action is prevented, because contraction of the ventricle, suffocative cough, or movement on the part of the patient prevent the more prolonged application of the remedy, and its firmer pressure on the part. Much of the good effect



desired may, however, be gained by a little patience, so that the use of more potent caustics is seldom called for. They have, however, been employed. The caustic alkalies are not well adapted for use within the larynx, nor is the *potassa c. calce*. Objections also exist to sulphate of copper and bichromate of potash, as solid caustics. In rare cases chromic acid has proved valuable, but it is exceedingly difficult to limit its action, and should only be resorted to with the greatest caution. For ordinary purposes nitrate of silver is the most suitable as well as the least dangerous.

Caustics may be used for various purposes. They are of the utmost value in certain cases of deep ulceration. When rapid destruction is going on by the ulceration of the later stage of syphilis, it may often be arrested by thorough cauterisation, and thus give time for constitutional remedies to be brought to bear. Caustics are also successfully used for the removal of hypertrophy, induration, and thickening of limited extent, as well as for the destruction of more defined growths in the larynx. Cauterisation is further frequently employed to the pedicle of a polypus that has been removed by instruments.

Nitrate of silver is also employed with the object of modifying the condition of mucous membranes, but within the larynx the solution is more frequently used for this purpose than the solid substance, though the skilful use of the solid admits of precise application to a minute spot, and to that only.

Some laryngoscopists employ the powdered nitrate by means of a delicate insufflator, and there may be a few cases in which it may be desirable to resort to this

method. For moderate cauterisation the nitrate should be diluted with two or three times its weight of sugar of milk or magnesia. For a more potent caustic equal parts may be employed. This will produce a more intense cauterisation than the use of the solid as above described, inasmuch as a larger quantity of the caustic remains on the surface ; but it is impossible to restrict the application to a portion of the surface, and is very rarely to be resorted to.

He who has acquired skill in applying solid caustic will not find it a great advance to proceed to the use of the laryngeal lancet, and it is desirable he should take an early opportunity of doing so, inasmuch as by this means he may be able on an emergency to snatch a fellow-creature from the very jaws of death. In those cases of rapid œdema in which the patient is being suffocated, the only plan is by means of the laryngeal lancet to give exit to the fluid, and thus at once restore the power of breathing. The same instrument is also occasionally required to open an abscess, and it has been employed as a scarificator in certain other conditions arising in inflammation. It is, however, to be resorted to with reserve whenever there is not great emergency in the case.

The laryngeal lancet is made of a similar shape to the other instruments, but the blade varies with the fancy of the operator and the object to be attained. The majority of operators use guarded lancets, the points of which can be pushed forward at the exact moment, and which at once spring back within their sheath. The engraving (Fig. 59) shows a laryngeal lancet in combination with a handle of a similar pat-

tern to that used by Stoerk for his guillotine. Another model is seen in the adjoining engraving (Fig. 55). I have mostly employed unguarded lancets; they are sometimes mounted on handles like those of other laryngeal instruments, but I strongly recommend the complete instrument to be forged of one piece of steel (Fig. 54), though it may be plated up to the cutting blade. Such instruments give more power and precision. In skilled hands—and others ought never to touch them—they are not excessively dangerous.

The next operation is interstitial or sub-mucous injection. It is analogous to hypodermic injection, but far more difficult. By means of a small pointed syringe of a proper form fluids are injected beneath the mucous membrane of the larynx, or into the substance of morbid growths in that organ. Some successful cases have been recorded; but a patient having died in Vienna a few minutes after the operation, it has since been less frequently resorted to. It is a method of treatment I do not recommend. In more accessible parts, however, such as the tonsils, and externally, interstitial injection, is often very successful. It may be carried on with an ordinary hypodermic syringe, but I have had a safety syringe made (Fig. 56), which is more convenient. It is provided with a long tube, and this is furnished with a guard, which by means of a screw can be set to any depth that may be desired.

One of the most delicate operations that have been performed is that of electrolysis within the larynx.

Professor Fieber, of Vienna, has related several cases of growths in which he has successfully tried this



FIG. 54.



FIG. 55.



LARYNGEAL LANCETS.

FIG. 54 Author's, constructed of a single piece of steel.

55 Guarded spring lancet, the blade protruded.

A Various shaped blades, for either lancet.

FIG. 56.



FIG. 56. Author's guarded syringe.

method. I was at the time occupied in making similar efforts, but was anticipated by him in the publication of the results, and therefore contented myself with recording his cases. (a)

The galvano-cautery may be employed instead of the other methods of destroying the old or new growths. This operation is one of great nicety, but has proved very successful. The instruments I employ (Fig. 57 on next page) are modifications of those recommended by Von Bruns, Voltolini, and others.

Faradisation of the larynx has been found very successful in functional aphonia. It is accomplished by means of a properly insulated electrode of the form of a laryngeal sound, which having been attached to the wire of one pole, is carried into the larynx, the other pole having been previously applied to the neck. The circuit is completed by pressing the index finger on a spring. This operation is a simple one; only a small battery is required, and the result usually satisfactory. Dr. Morell Mackenzie first proposed (b) to treat aphonia by Faradisation. His electrode—described in 1862, and exhibited at the British Medical Association in 1863—is very convenient. Indeed, the only modification of importance is that proposed by Dr. Fauvel, viz., the employment of two electrodes together, separated at the laryngeal extremity by about one-eighth of an inch, for Faradisation of the thyro-arytænoid, arytænoideus proprius, or posterior crico-arytænoid muscle. A third electrode,

(a) "Reports on Diseases of the Throat," in *Medical Press and Circular*, 1872.

(b) *Medical Times and Gazette*, 1862.

in which the extremities are separated to the extent of five-eighths of an inch, so that one pole may be in the larynx, the other in the hyoid fossa, is

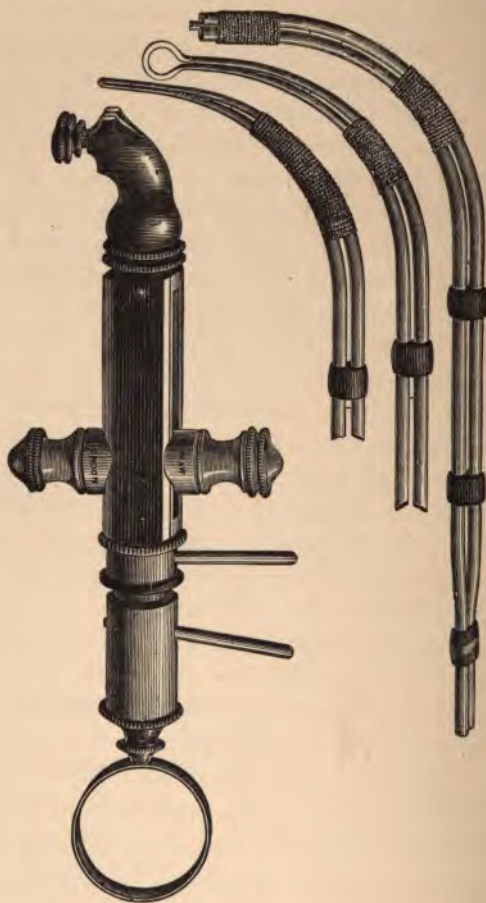


FIG. 57.



recommended in cases of unilateral paralysis of the adductors; but Professor v. Ziemssen has given (a) much more minute instruction for localising the effect of the electric current on individual muscles.

In some cases of aphonia associated with hysteria the effect of electricity is the almost immediate recovery of the voice. Such results astonish patients and their friends. Their gratification may, however, be short-lived, as the aphonia is apt to return again and again. General treatment should therefore be employed. These cases have been greatly vaunted, but are by no means those in which electricity renders the greatest service. In fact any stimulus, such as pencilling the larynx, will produce equally remarkable results, and I have often known the voice return on the mere application of the faucial mirror—a result which demands no explanation. In hoarseness or aphonia, resulting from laryngeal catarrh, the effect of electricity is often rapid; so it is in cases arising from overstraining the voice. In the early stage of laryngeal phthisis there is often a degree of paresis which is temporarily removed by the current. The prognosis of an obscure case, therefore, must not be too much influenced by the effect of electrical treatment. Such a warning is, however, more applicable when there is reason to suspect that the recurrent nerve is involved. In such cases the effect will be influenced by the nature of the lesion and the condition of the nerve filaments.

(a) "Die Electricität in der Medicin." Berlin. 1872. Also "Cyclopædia of Practical Medicine." English Translation, vol. vii.

Either the intermittent or the constant current may be also employed for various diseases in the throat without the introduction of one pole into the larynx. Those familiar with the clinical applications of electricity will find no difficulty in this, and as it scarcely belongs to *laryngoscopic* therapeutics, it is unnecessary to say more of it in this place.

Catheterism of the larynx and trachea has been tried in croup, diphtheria, and in some other cases of occlusion of the air-tubes. It has also been proposed by Weinlechner to resort to this measure for the purpose of injecting medicaments into the trachea and bronchi. An elastic catheter of large calibre, bent into proper form, may be employed. The plan seems to obtain little favour, but it is easy to imagine cases in which it might be resorted to. It is practicable to pass a small tube through the nose.

*Removal of Laryngeal Neoplasms.*—The laryngoscope revealed to us that morbid growths in the organ of voice are much more frequent than had previously been suspected, and at an early period attempts were accordingly made to remove them by mechanical means. *Ecraseurs*, wire loops, guillotines, and forceps of various kinds have been designed for this purpose. To Czermak is due the credit of being the first person to discern a polypus by means of the laryngoscope. The patient had suffered from hoarseness for a long period, and Czermak detected the growth in January, 1859, as related in the *Wiener Mediz. Wochenschrift*. Lewin seems to have been the first to dare to extirpate polypi, which he tells us (*Deutsche Klin.*, 1862) he did in 1860 by means of forceps and other instruments

introduced by the aid of the laryngoscope. In France, Fauvel employed forceps in 1861. (a) I believe the first person in England to remove a laryngeal growth by mechanical means was Dr. T. W. Walker, of Peterborough, who described his *écraseur* in the *Lancet* in November, 1861.

It will be easily understood that there is no small difficulty in carrying a simple loop of wire round a growth in the larynx. Many, however, prefer this method of operating. Gibb's instrument is suitable for this purpose. It consists of a carrying-handle for the wire, and a sliding cross-piece, against which the two first fingers rest. The wire being passed through two small holes at the point is carried along the groove and through the holes of the cross-piece, leaving a loop at the point of the size required. Two or three twists round the cross-piece suffice to fix it firmly. The instrument is to be very carefully introduced by the aid of the mirror, and the loop passed round the tumour like a noose, when it can be tightened by gentle, steady pressure between the thumb and fingers. The base of the polypus is thus divided, and its substance withdrawn in the loop.

Before introducing this or any similar instrument, the loop must be placed in such a position as to pass over the growth to be extirpated, and its size and shape should also be properly adjusted. If the growth be located on one of the true vocal cords the loop must correspond with the antero-posterior diameter of the larynx, while if the growth be situate in the anterior commissure, or on the under surface of the

“Du Laryngoscope, au Point de Vue Pratique.”



epiglottis, the loop must be arranged transversely to that diameter.

Contact with any part during its introduction will alter the shape of the loop, and so render it useless when it reaches the growth. Thus, supposing the loop to have been made round, and of a certain size, so as to pass over a growth, should it come in contact with the wall of the pharynx, or any other part, either accidentally or through reflex action on the part of the patient, it is obvious that the round opening will



FIG. 58.

STOERK'S WIRE-LOOP ECRASEUR.

- (a) Handle. (b) Ring for thumb. (cc) Ring for middle, and half-ring for index finger. (d) Wire carrier. (e) Protector. (f) Loop. (g

be made oval by even slight pressure, and so not adapted to pass over a globular growth. Moreover, spasmodic contraction of the larynx will sometimes occur, by which the loop may be obliterated, bent to either side, or backwards or forwards. To meet these difficulties Stoerk contrived his guarded wire-loop

*écraseur* (Fig. 58), in which the flexible wire is protected by a solid metallic loop. By this instrument very thin wire may be employed with greater ease than stout wire without the protector.

In Stoerk's guarded *écraseur* a metal tip bored with two holes is screwed on in such a way that the holes can be placed either antero-posteriorly or transversely, and thus the loop arranged for growths in various positions.

In favourably situated growths it is possible, with but little training of the patient, to introduce an unguarded loop, but for this purpose the wire employed must have a certain degree of firmness to enable it to retain its form. Good iron wire is perhaps the best for this purpose. That used for musical instruments is both stiff and elastic, and not too easily mis-shapen. Silver and platinum-wire are both very flexible, and therefore need the guard.

Sometimes the operator may be successful in his first attempt to snare a growth. It more often happens, however, that fruitless efforts are previously made. This is especially the case when the patient has not been properly trained, and in all cases it is desirable that the larynx should be accustomed to the contact of instruments before the attempt is made to extirpate a polypus. Local anæsthetics are also of use. It will be readily conceived that some forms of growth are better adapted for this operation than others, and therefore that other instruments have found favour.

Among these we may next consider guillotines. Türck designed one of these, which is used by some to this day. A handle somewhat like that of Stoerk has

been adapted to Türc's guillotine by Leiter. The next engraving (Fig. 59) shows this modified instrument. The guillotine itself, A, is seen to be of a square shape. The blade A, which in the figure is retracted, is either lance-shaped or has only one cutting edge. It acts by being pressed forwards, and therefore can be easily employed with the same handle as is the laryngeal lancet, B. If this form be employed

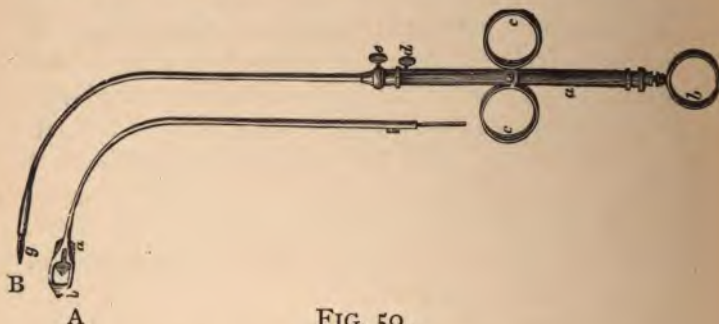


FIG. 59.

A, TÜRCK'S GUILLOTINE. B, LANCET, WITH LEITER'S HANDLE.

- (a) Handle. (b) Ring for thumb. (cc) Rings for fingers.  
 (de) Screws for fixing tube and contained wire.  
 (g) Laryngeal lancet. The guillotine is separate, its blade and sheath being marked A.

it is better to use the handle which Türc himself contrived for it, and in which the required forward movement is most easily made.

Stoerk's guillotine differs from Türc's in its shape and mechanism. The handle is very convenient, and adapted to a variety of instruments, as will be seen on



reference to the engraving, Fig. 60. This handle consists of a rod *a*, a ring for the thumb *b*, two others *c*, for the index and middle fingers. Into this handle the guillotine is fixed by passing through two apertures, one for the tube, the other for the wire which is connected with the blade, each being retained in position by screws as seen at *d*, *e*, *f*, *g*. The wire passes

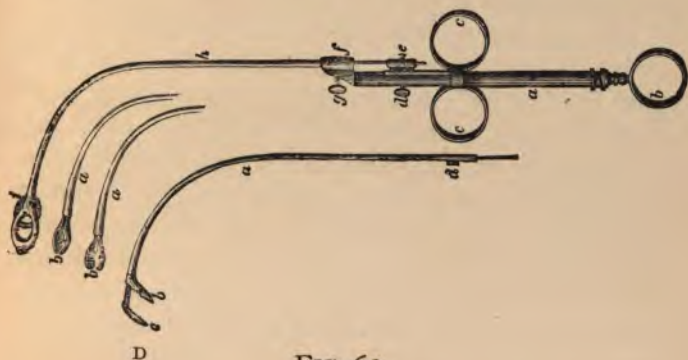


FIG. 60.

through the tube to the blade. When the screws are properly fixed the tube itself does not move, but traction can be made on the wire by pressing the fingers towards the thumb, when the rings slide along in the handle, drawing the wire, and of course the blade to which it is fixed, forwards.

It will be observed that this instrument cuts by being drawn up into its sheath, the motive power being the simple approximation of the fingers and thumb in the rings of the handle. This movement is certainly easier than the reverse one. Another advantage of Stoerk's guillotine is the shape of the blade, owing to

which it cuts at three surfaces instead of one. Moreover, in the square shape the corners project, and are more liable to touch and irritate the larynx. This instrument is well adapted for the removal of large tough growths where some force is required. It sometimes happens that firm pressure is needed to push the growth into the fenestrum, and in this case the strong frame is very valuable.

For smaller growths Stoerck afterwards made a great improvement in his guillotine. (*a*) He found that the first form was not unfrequently too large, so that a small growth might slip out before the blade could be drawn up. The size of the fenestrum also prevented its employment when the growth sprang from a vocal cord close to the anterior commissure. Then the protecting sheath covered its own thickness of the neoplasm, and so left that depth of its base unremoved. To obviate these inconveniences the following changes were made:—The lower part of the protector was dispensed with altogether, only the upper portion, of a crescentic shape remaining. It fits to the same handle as the older form. The engraving, Fig. 55, shows this improved guillotine, which I look on as the best ever designed. In the Fig. the fenestrated knife is seen projected at A; at B it is withdrawn towards the hollowed out crescentic protector. The blade must always be so placed in the sheath that the flat side of the knife is turned towards the side of the larynx where the polyp is situated, for the concave side of the knife does not permit of so accurate approximation to the laryngeal wall, and therefore the

(*a*) "Laryngoscopische Operationen," F. 2, 1872.

incision may not be deep enough, This guillotine may be pressed with such a degree of firmness as to cut away as exactly as possible the whole of the neoplasm. Obviously the more we have of the growth in the fenestrum of the guillotine, the more completely will it be extirpated. Experience has shown how often a portion of the base may be left behind and prove the seat of renewed growth. It is for this reason that cauterisation is so often recommended after the operation. Certainly this guillotine is the best for ensuring the removal of the whole growth, and Stoerk himself thinks that it is as well to cut away the normal tissue to the extent of one line rather than to be in uncertainty as to the removal of the base.

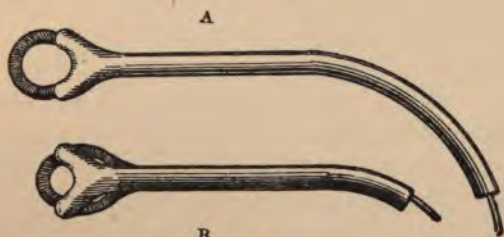


FIG. 61.

Several forms of tube forceps have been designed, one by Türrck, who seems to have contrived almost all sorts of laryngeal instruments. Leiter makes a pair to fit into Stoerk's handle, as seen in Fig. 60 *c*. In the same handle also fit Winterich's forceps, Fig. 60 *b*, consisting of two concave blades, which when closed form a half-sphere. The inner edges are sharp, and



the blades on their concave side are furnished with two small nooses to catch the growth when cut off. This instrument, therefore, acts on the principle of scissors. Several other forms of scissors have also been made. Stoerk has modified Winterich's instrument by removing a heart-shaped portion from the points so as to avoid the risks of catching part of the healthy cord when the growth is situated on one.

Mackenzie's tube-forceps differs from those already mentioned, inasmuch as the blades are fixed points in the perpendicular direction, the tube passing over the shoulder of the instrument, and thus closing the blades instead of drawing them into the tube. The spring is very conveniently placed, so that it can be easily pressed by the index finger; and various blades, opening either laterally or in the antero-posterior direction, can be fixed in the same handle.

Crushing forceps are made of various forms and sizes. One of the commonest is seen also in Fig. 60 D, as adapted for the same handle. Schroetter has modified this instrument for large tough growths by adding strong sharp teeth to the upper blade, and to the lower blade a groove to receive them. The great objection to all crushing instruments is the risk of healthy structures being seized, in which case the tearing away after the crushing would be excessively dangerous.

This brings us to one of the greatest advantages of the common forceps. In using them there is much less danger of such an accident. If a portion of the laryngeal structure be included in the blades, it is easy at once to open them, and withdraw the instrument.

Even when when a hard tough growth has been seized, but does not yield to such force as we deem prudent to employ, it can be instantly released.

The common forceps are made of several shapes and sizes, and the blades may be like ordinary dressing forceps or with cutting edges. The latter are the more useful, but should not be too sharp. Fauvel and the majority of Continental operators have the forceps curved like the other instruments depicted in Figs. 58, 59, 60. I have from the commencement recommended a right angle, or at any rate a near approach to it. I have also had made forceps bent at angles of about  $105^{\circ}$  and  $75^{\circ}$ . The last are useful in some cases of growths at the anterior commissure.

I have often enlarged on the convenience of giving *all* laryngeal instruments such a curve as to bring their two ends to a position at right angles with each other. For the evulsion of growths the form of the instrument is of much greater importance than in other cases. Dr. M. Mackenzie advocates the right angle, which he says he has long employed.

The accompanying engraving, Fig. 62, shows a set of three pairs, bent at the angles I have recommended. The middle one is rectangular, and the one most generally used. I am not aware that any one else has employed the other angles. Some of the blades, it will be seen, are like the ordinary dressing forceps; others have a cutting edge. The figure only shows the instrument opening antero-posteriorly, but it is necessary to have others opening laterally. Three or four sizes are also desirable.

A question has arisen as to whether the forceps

should be slender or comparatively stout. For myself I prefer a medium degree of strength. The advocates of stout forceps insist on their greater strength, and what is more important, the less degree of vibration. Those who prefer slender instruments assert, truly enough, that they are strong enough for any justifiable degree of force, while they do not obstruct the line of vision so much, and can therefore be more easily watched in the mirror until the growth

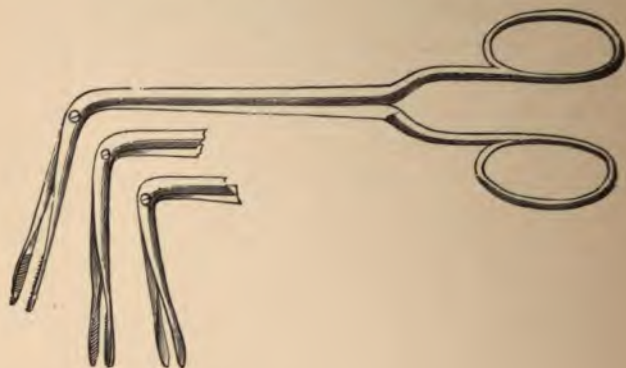


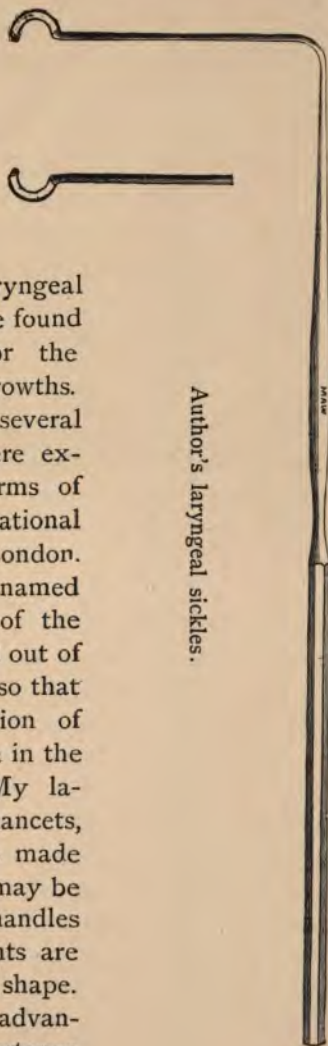
FIG. 62.

is actually seized. In connection with this it may be observed that Jellenffy does not pretend to see his forceps after they have entered the larynx, but is guided entirely by his previous knowledge of the position of the growth. On the other hand, in order not to interrupt the view, Dr. Cuczo had his forceps so constructed as only to open at the extremities.



Several French patterns on the same plan are both strong and efficient, and open in both directions.

Instead of the instruments previously described my laryngeal sickles (Fig. 63) will be found specially adapted for the removal of some growths. They have now been several years in use, and were exhibited with other forms of sickles at the International Medical Congress in London. These instruments are named from the sickle-shape of the blade. Each is forged out of a single piece of steel, so that there is no interruption of vibration by a variation in the conveying medium. My laryngeal sounds and lancets, as already shown, are made in the same way. It may be well to state that the handles of all these instruments are of the same size and shape. This is obviously an advantage, but of less importance



Author's laryngeal sickles.

FIG. 63.

Author's uvula sickle.



FIG. 64.

than that obtained by the construction of each instrument of a single piece of steel. Two forms of my laryngeal sickles are in use, cutting backwards and forwards respectively (Fig. 63). They are thus adapted for removing growths at the sides of the larynx, and particularly from the vocal cords, and they may claim to be considered as specially safe instruments, since their shape prevents them from injuring healthy parts.

Sickles are also adapted for other purposes. In fact, I had originally designed them for the uvula, for excision of which I employed them years before I used the laryngeal sickle. Fig. 64 shows the form of my uvula sickle, which also illustrates the shape of the tonsil sickles. These last are made with different sized blades. It is a good plan to have all these instruments nickel-plated, except of course the cutting blades.

### XIII.

#### ACCESSORY THROAT THERAPEUTICS.

Remedies reaching the Respiratory Mucous Membrane without the aid of the Laryngoscope. Gargles. The Nasal Douche. Irrigators, Syringes, Atomisers, Nasal Bougies, Sounds, &c. Insufflations. Sternutatories. The Pharyngeal Douche and Irrigator. Lozenges. Fumigations. Inhalations. Atomised Fluids or Sprays.

THE attention bestowed on laryngoscopical therapeutics is not intended to extol topical treatment to the exclusion of other remedial agencies. I have always maintained the importance of general treatment, and desire even in a work like this to impress upon the reader the danger of confining his attention entirely to local manifestations and local measures. It is not desirable to enter here on the principles of general therapeutics. These should be familiar to every physician. It is, however, necessary, in order to complete the subject, to speak of several remedies which, though they are not applied by means of the laryngoscope, act locally on the respiratory mucous membrane, and may be considered as supplementary



to those spoken of under the term laryngoscopic therapeutics.

*Gargles.*—The value of this ancient mode of applying remedies has given rise to no little discussion. Some have almost excluded gargles from their practice, while others have relied upon them to a great extent. The former have maintained that they never come in contact with more than the anterior surface of the velum and uvula, and perhaps a portion of the tonsils. The latter have endeavoured to show that they penetrate much further. Even were the first allegation correct, there would still be a use for gargles, but it is now generally abandoned.

These diverse views have no doubt partly depended on the inclusion of several distinct acts in the term gargling. A mere mouth-wash may be so employed that the anterior surface of the velum is subjected to its influence. The word gargling, however, is generally understood to imply that the air is to be expelled through the liquid with sufficient force to make the bubbling noise which many seem to consider so essential to the process. But a moment's thought will suffice to show that the liquid may be permitted to remain in the position it occupies as long as the breath can be held, and further, that expiration may be carried on so gently as to prevent any bubbling noise being heard. If, now, any attempt be made either to swallow or inspire to a very slight degree, the liquid may pass further, and yet be arrested before it sets up any spasmodic action.

The act of gargling may be well studied in conjunction with that of swallowing, and the reader will no

doubt be aware of the diversities of opinion that have prevailed respecting the physiology of deglutition. We all know that soft bodies produce little irritation in the larynx compared with hard ones, though as previously pointed out, a drop or two of liquid coming unexpectedly on certain parts may at once set up spasm.

It is believed by many that the use of the epiglottis in closing the air passage during deglutition has been somewhat exaggerated. Certainly I have met with many cases in which great destruction of the epiglottis had occurred—some in which it had been entirely destroyed—without the power of swallowing being greatly affected. On the other hand, we constantly see swelling and ulceration of the epiglottis associated with pain and difficulty in deglutition. M. Krishaber having masticated and insalivated a little bread crumb, pushed it with his finger over the edge of the epiglottis, and then by an inspiration drew it into the air passage, expelling it again by a sudden forcible expiration. M. Guinier, of Montpellier, (*a*) had previously observed on himself by means of the mirror, that such a morsel of soft bread could come upon the closed glottis without causing any uneasiness. The last-named author subsequently attained such command over the parts as to allow liquids to flow into the larynx, and remain there several seconds. This is what he calls "laryngeal gargling." (*b*). We must

(*a*) *Nouvelles Expériences sur la Deglutition faites au moyen de l'Auto-Laryngoscope.*—*L'Union Méd.*, 1865.

(*b*) "Etude du Gargarism Laryngien." Paris, 1868.

remember, however, that the presence of the mirror in the throat during an effort to swallow completely changes the conditions to be studied. In the natural act of deglutition there can be little doubt that the air passage is generally closed. The impossibility of breathing during that act, and the spasm excited by the entrance of small quantities of the food or drink, seem to show this. Besides, if we eat any substance that will impart a distinct colour to the membrane over which it passes, and then practise auto-laryngoscopy, we find that it discolours the anterior surface of the epiglottis, but not the posterior, still less the mucous membrane of the vestibule of the larynx.

From what has preceded, it will be readily understood that the act of gargling may vary very much with the individual. Accordingly, we find that some persons never learn to gargle properly, while others achieve what at first seems impossible. Singers generally acquire considerable control over the parts, while those who have never learned to gargle sometimes find it no easy task. The majority of patients, in point of fact, require some instruction respecting the end to be attained. In using a mouth-wash the velum and uvula descend so as to cut off all communication with the pharynx. In gargling, as frequently understood, the result may be almost the same, the liquid coming in contact with the anterior surface of the velum and uvula only. If, however, the patient should now raise the velum, as many can do, some of the liquid will flow into the pharynx. There it produces a desire to swallow, and unless the patient can control this some of it will pass into the œsophagus and



stomach. Some persons, however, instead of yielding to the desire to swallow, suddenly jerk the head forwards, and a quick forcible expiration taking place at the same moment, the liquid is expelled through the nose. What they do involuntarily can be accomplished by others deliberately and without inconvenience. In persons possessing this control over the parts we may often obtain good results from a natural nasal douche thus employed.

It is by no means so easy to let the liquid enter the larynx, and in spite of persistent efforts, many will totally fail in the attempt. Of course, the glottis must be kept closed if the fluid is to rest upon it, and therefore the duration can only be while the patient can hold his breath. M. Guinier, who has demonstrated his method with the laryngoscope, says that the head should not be thrown back, as the less it is raised the less urgent is the desire to swallow. The mouth should not be quite closed. With these precautions he takes the liquid into the mouth, brings forward the lower jaw, and closes the glottis by the uncompleted act of emitting a vowel sound. The velum in this disposition of the parts is raised, and the base of the tongue perhaps falls a little, so that the liquid finds its way into the larynx, where, if the patient can completely control the sensibility, it may remain as long as the breath is held. The slightest attempt to inspire will bring on spasmodic cough. Only the few can expect to attain success in this method, and its use is therefore very restricted, especially when we remember that there are other modes of applying liquids to the laryngeal mucous membrane.

In gargling it is more important to manage the respiration than deglutition. If compelled to swallow, the patient merely receives a little of the fluid in his stomach, and unless the gargle should contain some noxious ingredient, there is an end of the incident. On the other hand, entrance of the fluid into the air passages may give rise to severe laryngeal spasm.

Astringents, disinfectants, and antiseptics are the remedies most frequently required in this form, but anodynes may be utilised in the same way. One of the best gargles is a solution of alum, the strength of which may be varied according to the effect required. Chloride or nitrate of aluminium may be employed for the same purpose. For a powerful astringent, tannin may also be used—one or two drachms in half-a-pint of water, to which a drachm of rectified spirit or an ounce of glycerine has been added. Borax and chlorate of potass are also useful as both gargles and mouth-washes. The former is slightly alkaline as well as astringent; the latter possesses special value in an aphthous condition of the buccal and faucial mucous membrane, and is often advantageously combined with decoction of bark. Sometimes it is desirable to employ the alkaline carbonates as gargles or mouth-washes. As a disinfecting wash and gargle Condyl's fluid is excellent; chlorinated gargles are also valuable. Carbolic acid (2 to 4 gr. per oz), besides being antiseptic, is a good stimulant to the pharyngeal mucous membrane, but its flavour is to some persons very disagreeable. Then, if indicated, it may be better to pencil the parts with the solution, as already mentioned. When more diluted ( $\frac{1}{2}$  gr. to 1 gr. per oz.), it often appears to

exercise a soothing influence on mucous membrane. It may be that this is in some way allied to the anæsthetic effect which it produces when applied to the skin, but in that case it is only observed when used in strong solution, while for the purpose I have just named it has to be very freely diluted. The effect of carbolic acid differs indeed very greatly according to the amount that is employed.

Carbolate of soda is a useful detergent antiseptic for a gargle. Carbolate of zinc is decidedly astringent also.

I have had excellent results from lactic acid, both as a gargle and in the form of spray. Three or four drachms or more may be diluted with eight or ten ounces of water. This remedy is of special value as a solvent in diphtheria. The lactates and lime water are also used in the same disease.

Mineral acids ought not to be employed as gargles, as they destroy the patient's teeth, and less injurious substances are equally or more efficacious.

It is obvious that it is not desirable to order gargles for children who have not learned to use them, or for persons whose fauces are so inflamed as to make all movements of these parts painful.

Gargles are usually employed cold, but occasionally—especially when anodyne—they are ordered tepid. In some cases, as to restrain hæmorrhage and to allay pain, they may be employed hot.

The *Nasal Douche* may be mentioned next, inasmuch as it is in one sense supplementary to gargling. By it the fluid is brought into contact with a portion of mucous membrane which, in the majority of per-



sons, is otherwise inaccessible to local treatment such as the patient can employ. The simplest form of apparatus is the ordinary syphon douche, consisting of elastic tubing with a nose-piece, the distal end being placed in a vessel of the liquid to be used. When a more perfect apparatus is required and expense is no object, the form shown in Fig. 65 will be found to answer every purpose.

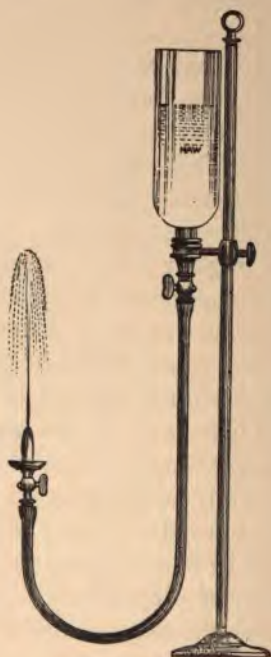


FIG. 65.

The nasal douche is, of course, most serviceable where the disease is located in the posterior nares, (a) but is also of value in some laryngeal cases. The liquids most serviceable for the nasal douche are weak saline and alkaline solutions. Half-a-drachm of carbonate of soda in a pint of water; or with a little glycerine, is one of the best forms, being both safer and more agreeable than the chloride of sodium so often prescribed. Borax, or boracic acid, may be used for the same purpose. By these the mucous membrane may always be thoroughly freed from the discharges, and thus prepared for other remedies. Detergents like muriate of ammonia are sometimes useful. To any of these antiseptics and disinfectants may be added, or the latter may be used alone. The permanganates possess a special action on the membrane. Chlorinated solutions are often very useful. Carbolic acid and the carbolates also exercise a most valuable influence on the membrane. Eucalyptus oil, sanitas, and other antiseptics are sometimes preferable. Astringents may be afterwards resorted to in many cases, the chlorides of aluminium, zinc, and iron being employed *in very small quantity*.

The nasal douche should be used tepid at first in all cases. Occasionally it may be desirable to decrease the temperature, especially when astringents are used. A temperature of 85° Fahr. may then be

(a) See the author's paper on Ozæna, read before the Medical Society of London, October 20, 1871, *Medical Press and Circular*, December 6, 1871. Reference may also be made to the author's contribution to the same journal on Specific Diseases of the Throat (January 10 and February 28, 1872).

employed, and gradually reduced to  $75^{\circ}$ , or even  $70^{\circ}$ . Very rarely do we descend to the ordinary cold water. The patient should breathe quietly, and restrain any movement of deglutition, or order that the Eustachian tubes may remain closed. It can no longer be doubted that in using a nasal douche the accidental entrance of fluid into the ear has given rise to serious results. It is not necessary to have much pressure—just enough to cause the fluid to flow through the nares will suffice, and this will be produced with an ordinary syphon douche, when the vessel is not raised above the patient's head. It is a good plan for the patient at first to hold it himself,—he will scarcely then lift it too high, or he may be told to let the vessel rest on his head. The soda solution above-named is the best for removing hardened secretions. I have also found it less irritant than the salt solution so constantly used, and Weber-Liel (a) has shown that it is less likely to injure the ear—a conclusion quite in accordance with my experience. A weak saline produces less stuffiness than pure water. In using astringents care should be observed to use them weak enough. Half-a-grain per ounce of sulphate or acetate of zinc is quite enough. One grain, occasionally two, of sulpho-carbolate will serve for a stronger astringent and detergent. More is apt to give rise to headache, local irritation, and other unpleasantness. Alum is said to have impaired the function of smell. The douche should be used once or twice a day—seldom oftener, but it is necessary in many cases to continue it for a long time.

(a) *Berliner Klin. Woch.* April 1, 1878.



*Irrigation.*—I have designed tubes with perforated extremities, by means of which the nasal passage can be carefully irrigated by the physician, both from the front and back. In this way we may apply fluid remedies which should not be entrusted to the patient.

*Syringes* and *atomisers* constructed for the purpose can also be used to convey medicated fluids to the nasal passages.

Besides these methods we may sometimes avail ourselves of the more primitive plan of snuffing up the liquid by a series of sudden short inspirations. Fluids may thus be taken up from the hollow of the hand or from a convenient vessel. Some persons acquire a trick of this kind, and call it "drinking through the nose."

*Nasal Bougies, Sounds, and Catheters.*—I have obtained good results from instruments of this kind, the differences between which will be obvious from their names. They sometimes shed light in diagnosis, but are more valuable in treatment. They should be made of the finest vulcanite, which can now be had quite flexible. These bougies may be used for their mechanical effects, or made purveyors of drugs with which they are coated (ointments of iodoform, mercury, &c.). Soluble medicated bougies of gelatine, &c., are also useful, and may be left to dissolve in the nasal passages.

*Insufflations.*—Powders may be applied to the nasal or pharyngeal mucous membrane by means of properly constructed insufflators. They are often very useful as adjuncts to other treatment—particularly diseases near the orifice of the Eustachian tube, and other con-

ditions giving rise to deafness. I have used a variety of tubes of glass and vulcanite for these purposes.

*Sternutatories*, if old-fashioned, are often useful in diseases of the pituitary membrane, and are readily used by snuff-takers. A great variety of drugs may be employed in this manner, especially astringents.

*The Pharyngeal Douche and Irrigator*.—It is easy to direct a stream of liquid on the posterior wall of the pharynx. For this purpose I have arranged mouth-pieces which can be used in place of the nose-piece of the nasal douche. Some patients learn to employ this method themselves. The liquids are such as have been recommended for the nasal douche, and for gargles, but their strength should be between these two.

My pharyngeal *irrigator*, like its nasal fellow, consists of a properly shaped silver tube perforated at the extremity by numerous minute holes, so that the liquid can be projected in a fine shower by means of a small Higginson's syringe attached to it. The *atomiser* may be resorted to when it is desirable to break up the fluid into a fine spray, but both the pharyngeal and nasal irrigators will often be found of service.

*Linctus*.—In order to somewhat prolong the action of fluids, they may be rendered thicker and more glutinous by sugar and other additions. We then have the linctus, loch or lohoch, called also eclegma, eclectos, ecleitos, elegma, and illinctus; various terms derived from *εκλειχω*. Various syrups and mucilages may be used for the same qualities, or may enter into the composition of the linctus. Glycerine, from its

slowness to evaporate, may be used to attain the same end, and is indeed rather too popular, for since the glycerine of tannin and borax were introduced to the pharmacopœia, their routine use has become quite an abuse.

As sprays take an intermediate place between vapours and liquids, so between these and solids we may place—

*Confections* or *electuaries*, in which we have a tenacious semi-solid substance, which may be slowly dissolved in the mouth, and thus the local action of its ingredients prolonged; though these preparations are also used as vehicles for systemic remedies. In *confectio opii* the galena, mithridate, philonium and theriaca of antique pharmacy survive.

*Lozenges* may be looked upon as the modern representatives of the ancient remedies termed “hypoglotides,” which Galen, Dioscorides, and others were accustomed to prescribe. The name was derived from the dose being placed under the tongue of the patient.

The attention bestowed on the process of deglutition in connection with gargling precludes the necessity of considering it in reference to lozenges. The local effect of certain substances on the mucous membrane is often obtained by the employment of lozenges, which should always be allowed to dissolve in the mouth without breaking them by the teeth, and should also be swallowed very slowly, so as to prolong their action as much as possible. It is, however, to be remembered that as lozenges are swallowed their effect on the stomach is not to be forgotten. Indeed, their liability to interfere with digestion is one of their disad-



vantages. Some lozenges, as those containing morphia for instance, are also used for their general effects. Indeed, some of those in the British Pharmacopœia are only of use for their constitutional effects ; they are, in fact, merely dosed general remedies. Others, however, are most valuable for their local action. It is obvious that these two qualities may often be combined.

The uses of lozenges have been fully considered in my paper on "Local Remedies in Diseases of the Throat and Mouth," presented to the annual meeting (1880) of the British Medical Association at Cambridge. I then laid down that for special topical use lozenges should possess the following qualities :—

1. They should dissolve slowly in the mouth, so that the resulting solution of the medicament may remain as long as possible in contact with the mucous membrane ;
2. They should possess a certain degree of softness, so as not to hurt the diseased surface mechanically ;
3. For the same reason their shape should be without corners ;
4. Their flavour should be agreeable, or as little distasteful as possible ;
5. They should keep without change for an indefinite period, as they cannot be advantageously made in small quantities.

The lozenges of the British Pharmacopœia are most defective on account of their hardness. They irritate the mucous surface ; and the sharp corners of some shapes in common use, or of the broken pieces of others, may enlarge ulcers, tear congested membrane, or do other injury. Of course, when used for their constitutional effect, these objections may scarcely apply. A softer consistence has been attained by the

employment of fruit-paste, as in the favourite black currant lozenges, and this substance has been more extensively used of late years. Extract of liquorice, as in "Pontefract cakes," and gelatine have also been utilised. A more recent innovation is the effervescent base introduced by Mr. Cooper, which, for some purposes, is of special value. The French, so famous for all kinds of confectionery, have given us the *pâte de Guimauve*; but the defect of this is that it does not keep well. We owe to them also our best jujubes, a sweetmeat first made with the juice of the *Rhamnus zizyphus*, but now never containing that agreeable fruit. Experimental experience, extending over more than a quarter of a century, leads me to conclude that a *pâte de jujube* of the best French method of manufacture will be found most generally useful as a base. It fulfils all the indications required; it can be variously flavoured and coloured, divided into lozenges of any size or shape, and medicated with the most suitable remedies. It does not excite nausea or cause indigestion, and does not change too much after months of exposure. It is, therefore, adapted for lozenges prescribed for their topical influence, and is equally available for those given for their effects on the system.

Lozenges are more extensively used than could have been supposed when the London and Dublin Pharmacopœias rejected them. Everyone who remembers that time will know that, in spite of that discouragement, every large pharmacy was obliged to keep a considerable number. Before me lies a list of upwards of 150 formulæ in use at that date. It comprises nearly all in common use now. Rhatany, an

excellent astringent, still extensively prescribed for local purposes, is in that list, and was known long before. So with cubeb lozenges, which have lately been forced into extensive sale by a vendor who vaunts them as "bronchial troches." We have, in fact, few new lozenges. Red gum has been introduced; so, too, has carbolic acid; chlorodyne can scarcely be counted, being only morphia disguised; superior glycerine jujubes may be had at any leading pharmacy, or of inferior quality as an advertised panacea.

The lozenges comprised in the long list alluded to might be classified according to their therapeutical uses—*e.g.*, antiseptics, disinfectants, astringents, demulcents, sedatives, anodynes, sialogogues, special stimulants, &c. It will suffice, as illustrations, to refer to those made from my formulæ by Messrs. Allen and Hanburys, who have long sold them under the name pastilles. As the words *trochisci* and *tabellæ* have become associated with the harder lozenges, as jujubes seem to savour too much of sweetmeats, and as these are distinctly medicinal agents, we called them "pastils," an old English word more familiar in the French *pastilles*, and derived from the Latin *pastillus*, which was used by Celsus for such a purpose; *pastilli* is, therefore, an appropriate name in prescriptions.

With regard to dosage, those pastilles, which are intended to replace the British Pharmacopœia lozenges, have been made of similar strength, as it was considered advisable not to burden the prescriber's memory too much. This is specially the case with the pastilles of morphia, those of morphia and ipecacuanha, and those of opium; in each of these the pastille may be



regarded as an agreeable substitute for the lozenge. So, too, with the simple ipecacuanha pastille, which will be found much more popular with children than the lozenge. The same remark applies to *pastilli ferri*. Each pastillus aconiti may be considered equivalent to half a minim of British Pharmacopœia tincture, and prescribed accordingly. The pastillus expectorans, or morphiæ et ipecacuanhæ compositus, is a combination of the simple one with other expectorants, and will be found most serviceable in bronchitis, chronic coughs, &c. The chlorate of potash pastilles are not so strong as the lozenges, and may be taken in twice the usual doses; they are, however, very efficacious, and the disagreeable flavour is so successfully concealed that few can detect it. If large quantities are needed, other modes of administration may be tried. The pastillus sodæ chloratis I introduced as an efficacious and pleasant substitute for the potash salt. The lithia pastille contains a grain of the carbonate, and is valuable for both its local and remote effects. The benzoated pastille will be found the most agreeable of all mild voice lozenges, and may be taken shortly before speaking, reading, singing, preaching, &c., to give tone to the vocal apparatus. In obstinate or chronic cases, the camphorated pastille is a still more powerful voice-lozenge, but, unfortunately, its flavour is not nearly so agreeable. This is, in fact, the only one of the series that can be considered unpalatable.

*Fumigation* is a term frequently applied to the plan of drawing the fumes of any substance into the nose, throat, or any part of the respiratory passages. This

is sometimes accomplished by burning the substance so as to fill the room with the fumes, or by igniting a small quantity in any convenient vessel, and inspiring the vapour as it rises. The former plan is commonly employed for sulphur, and some other substances. As, however, the gas or fume is inspired, we might include these under the term inhalations. Unsized paper, saturated with nitre and other substances, when ignited, gives rise to fumes, which have been inspired with benefit, particularly in asthma. Trousseau and Pidoux recommended (*a*) balsamic substances to be heated over a lamp, or thrown upon live coals, so as to fill the room with the anodyne fumes. Turpentine is so volatile that it is only necessary to sprinkle it from time to time about the room in order to keep up a terebinthinate odour—a plan available also for other volatile substances. Carbolic acid may be employed in the same way, but in order to keep a room antiseptic it is necessary either to quicken the evaporation or to spread the solution over a larger surface, and to protect every entrance, so as to compel the incoming air to traverse cloths dipped in the solution. By means of Savory and Moore's vaporiser a room may be filled in a few minutes with the vapour of carbolic acid, sanitas, or other disinfectant. We may also diffuse carbolic acid through the room by Dr. Lee's steam draft inhaler, but in that case it is carbolised aqueous vapour which we employ. For diffusing the vapour of iodine through a room a watch-glass containing a little of the element floated on a saucer of hot water, is a simple apparatus, but to

(*a*) "*Traité de Therapeutique.*" Paris, 1869.

localise the effect a glass inhaler, such as Maw's, should be used. The vapor chlori of the British Pharmacopœia requires no apparatus (though it is convenient to have one), and may be called a fumigation.

*Inhalations.*—This term is commonly restricted to the breathing of steam, either alone or impregnated with medicinal substances, but it is equally applicable to other modes of administering remedies through the respiratory mucous membrane. Some of these have been named under the previous heading, others are the inhalation of gases, of which oxygen is the most important, and for which Barth's apparatus is very convenient. The inhalation of simple steam is a most valuable remedy in a great variety of cases. So useful is it that much of the good effect of many inhalations may be traced to its influence. Great good arises in croup from keeping the atmosphere of the sick-room saturated with steam. I urged the value of the systematic use of steam in croup about a quarter of a century ago, and this method has lately again been brought forward by German authorities. In the early stage of acute catarrh the inhalation of steam is most grateful to the patient, and not a few cases of bronchitis find relief from the same remedy. It supplies moisture to the dry inflamed surface, and its soothing effect is often manifested by procuring sleep after narcotics have failed. The simplest plan is to inhale slowly the vapour arising from a jug of hot water. A more effectual plan is to take a large sponge, dip it into hot water, squeeze it sufficiently, and then hold it over the mouth and nose, drawing



the breath through it. In this way the air is saturated with warm vapour just as it enters the respiratory passages. For simple steam inhalations this plan is the best, but when we desire to add medicinal agents some kind of inhaler is always more convenient, and frequently necessary. Any of the common inhalers, such as Nelson's or Maw's double-valved, will suffice for this purpose, and frequently an ordinary jug may be made to do duty. In Robson's inhaler the air is drawn through the medicated fluid. For use in bed a long tube is convenient, as in Mudge's and the eclectic inhaler. When the patient can sit up Lee's steam draft inhaler is the least fatiguing, as it delivers the steam at a proper temperature. In using this with carbolised water the medicine escapes continually in the same proportion, as shown by Dr. Lee.

Any volatile substance can be easily employed in the form of inhalation, and those herbs the therapeutic value of which depends on an aromatic volatile principle are often thus used; or this principle is previously extracted, as in the case of essential oils. The soothing properties of steam are often increased by employing hops—the vapour of the freshly-made infusion being charged with the sedative properties of the plant; the oil of hops is too irritating to substitute for the crude drug. Chamomile flowers may be used in the same way. Another aromatic sedative is obtained by putting a teaspoonful of tinct. benz. comp. into the inhaler with a pint of hot water. The vapor coniaë of the British Pharmacopœia is more distinctly sedative—its efficacy depending on the conia being set free by the alkali. It is for this reason that the potash

should be added at the time. The *succus conii* is to be preferred to the extract, as more reliable. The vapor *acidi hydrocyanici* is employed with cold water, but may be ranked among sedatives. The volatile parts of opium can be utilised by putting the tincture or the solid drug in the inhaler with hot water. Ether and chloroform may be used with water at a low temperature. Conium or opium, in combination with chloroform, and similar compound inhalations, will often prove of service when a simple one fails. It is, however, obvious that very volatile substances may be as well administered without the medium of water. A very simple inhaler, or a little cotton-wool in a cone of paper, will suffice for chloroform, ether, and nitrite of amyl.

Besides anodyne inhalations, those possessing stimulant properties are most important. In the *British Pharmacopœia* there are only three—vapor *chlori*, *creasoti*, and *iodi*. The mode of using differs in each case, while each vapour is a special stimulant. Camphor is a good stimulant for inhalation. Ten drops of the spirit may be put into the inhaler to begin with. It is better to dilute it with more spirit. In like manner most of the essential oils can be used as stimulants. They can be dissolved in spirit or diffused through water by means of magnesia, or powdered *silex*, in the manner often resorted to for making medicinal waters. The oils of aniseed, cajeput, cloves, cinnamon, marjoram, myrtle, rosemary, and others are adapted for this purpose. Ammonia is a general stimulant often resorted to, and may be utilised for its local effect.

The late Dr. J. A. Symonds recommended (a) solutions of balsams in ether, or pyro-acetic spirit, to be inhaled from an ordinary wide-mouthed bottle, the warmth of the hand holding it being quite sufficient to volatilise the liquid. I prefer ether to the pyro-acetic spirit. Spirit of chloroform may also be used by this method. Half-an-ounce of benzoic acid in an ounce of ether forms a standard solution, to which two drachms of balsam of Peru, or of Tolu, or of any similar substance, may be added. Turpentine may also be used in this way, or may be made the menstruum. Other rather volatile drugs, such as creasote, carbolic acid, iodine, the essential oils, &c., can, if desired, be employed in this manner without steam.

*Atomised Fluids.*—Liquids which are not volatile can be made available for inhalation by reducing them to a fine spray. So soluble solids can be dissolved and the solution used in the same manner. All the common atomisers or spray-producers consist essentially of a pair of Bergson's tubes, with an arrangement for driving air or steam through the upper one. The tubes are fixed at right angles to each other, one descending vertically into a bottle containing the liquid to be atomised. The rush of air or steam through the horizontal tube exhausts the perpendicular one, the fluid rises, and is sent forward in a fine spray. In Siegle's inhaler (Fig. 66) the force employed is steam generated in a boiler by means of a spirit-lamp. In the hand-ball atomisers, the steam boiler is replaced

(a) *British Medical Journal*, 1868.



by a pair of bellows consisting of two india-rubber balls with proper valves. The bottle being held in one hand and the bellows worked with the other, the medicine is projected in a fine spray, which can be inhaled.

The simplest atomiser is probably that which I introduced to the Medical Society of London many years



FIG. 66.

ago (Fig. 67). This apparatus produces a good spray, and is so inexpensive as to place this mode of treatment within the reach of all. The tubes are placed parallel instead of at right angles to each other. The distal end of the upper tube is formed into a cup which holds enough liquid for each occasion. The fluid finds its way by gravity to the point, and the air is blown through the lower tube by the ordinary double bellows. This atomiser is much more simple in its construction than any other, as will be seen on reference to the engraving, Fig. 67. The bottle is dis-

pensed with altogether. The tubes, being of glass, can be replaced, if broken, at a small cost.



FIG. 67.

My atomiser is easier to use than more complicated instruments at three or four times its price, and will be found the most convenient apparatus wherever it is desired to use a spray. I find in practice that sprays are generally useful when it is an advantage to give them cold; while for warm applications I mostly resort to the mode of inhaling steam impregnated with the remedy. It is mostly advisable to administer astringent sprays cold, though, of course, they may be used warm. Anodynes are applicable either way, but more frequently should be taken warm. A great advantage of my atomiser is, that the tubes can be held

far enough in the mouth to prevent the spray spreading over the face, which can only be prevented with steam atomisers by the use of Beigel's screen, or a glass tube, as shown in Fig. 66. After warm inhalations it is often desirable for the patient not to go into the open air, or into a cold room; but the cold spray is the best possible preparation for such sudden changes of temperature.

As astringents, the remedies most commonly used in the atomiser are solutions of metallic salts, sulphate, acetate, and chloride of zinc, alum, perchloride of iron, and sulphate of iron. The strength of the solutions of these salts may vary from two to ten grains in the ounce, or more, according to circumstances. Nitrate of alumina (two to five grains) was tried by the late Dr. Beigel, (*a*) who also used many other substances, including acetate of lead, chloride of sodium, and even cod-liver oil. As a vegetable astringent, tannin is very effectual. It varies much in the dose, and is often given too weak to be effectual. According to the effect required, the strength may vary from a single grain per ounce to fifteen or more.

Permanganate of potash, one to five grains per ounce, is disinfectant and stimulant, and in some cases exercises a most happy influence on mucous membranes. In other cases calx chlorata, two to five grains, is preferable; or we may use the liq. calcis chloratæ, or the liq. sodæ chlor., ten to sixty minims, or liq. chlori., two to thirty minims per ounce. Carbolic acid, one to five grains, is a good stimulant, and in some cases, as already stated, is also anodyne. The sulpho-carbo-

(*a*) "On Inhalation." London, 1866.



lates are also useful, that of zinc being distinctly astringent. Borax and boracic acid are good detergents.

As solvents, lime water and lactic acid have been most used: I have most experience of the latter. To dissolve the false membrane of diphtheria, about half a drachm in the ounce will be strong enough generally both for gargle and spray, but I have had to use it much more concentrated.

Solutions of the alkaline carbonates and their salts form a very useful series. Thus, the carbonates of soda, potash, or lithia may be tried, two to ten grains. Muriate of ammonia, eight to fifteen, is reputed to possess peculiar effects on the faucial membrane. The local influence of chlorate of potash, now well understood, may be obtained in this way, two to ten grains. For a long time I have preferred the analogous salt of soda, which, as stated under lozenges, I have used in that and other forms.

A number of mineral waters are also used as sprays. Those containing sulphur, or chloride of sodium, are most in repute.

Corrosive sublimate is sometimes used in specific cases, but such remedies should only be used with circumspection.

Demarquay recommends glycerine to soothe an irritated pharynx, and the late Dr. Scott Alison employed this fluid in laryngitis and tracheitis. Laudanum and solution of the salts of morphia can be used in the form of spray, five minims to twenty at a time, properly diluted; so can the tinctures of hyoscyamus, conium, belladonna, &c. The bromides, ten to fifteen

grains, are often recommended as anæsthetics, but though useful for other purposes, they will scarcely accomplish this. Anæsthesia, when required, can be easily produced by a spray of the new remedy, cucain muriate (see p. 113).

In asthma success seems to have followed Fowler's solution, five minims at a time, administered in this manner. Recently, Professor Sée has recommended sprays of iodide of potassium in this disease. Other uses for this drug will occur to the reader, and solutions of iodine have also been used.

Etherial solution of iodoform has proved valuable also in this form. Sulphurous acid is generally prescribed too diluted. It may be employed pure, as advised by Dewar (*a*) and Pairman (*b*), or it may be diluted with one, two, or three parts of water. It should be recently prepared.

In conclusion, the atomiser has been used to fill the patient's room with aqueous vapour, or with a solution of sea salt, so as to make an artificial sea air, or with carbolic acid, or other medicinal agents. Though the plan has now been some time before the profession, it has probably even yet not received the extension to which it is destined.

(*a*) "On the Application of Sulphurous Acid to the Prevention and Cure of Contagious Diseases." Edinburgh, 1867.

(*b*) "The Great Sulphur Cure brought to the Test." Edinburgh, 1868.

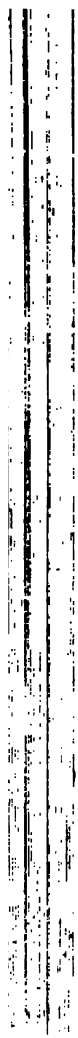






PLATE 1.



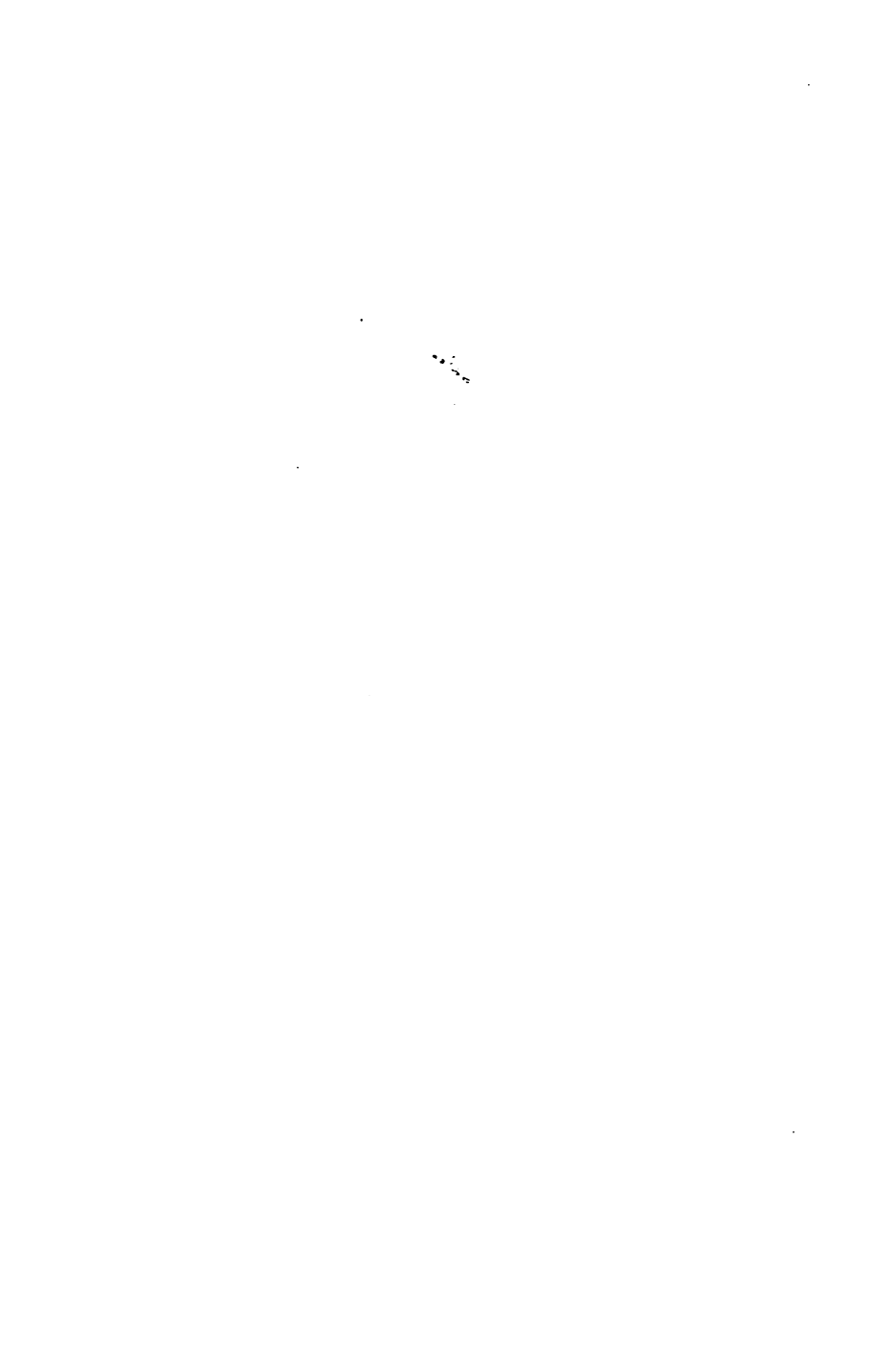




PLATE 2.



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## EXPLANATION OF PLATES.

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### PLATE I.

FIG. 1.—The Laryngeal Image presented in a Case of Acute Laryngitis. There is hyperæmia of the whole mucous membrane; gorged vessels are distinguishable in several localities, one on the left vocal cord and others on the epiglottis being particularly observable. There is also great swelling about the arytenoids, the natural form of the parts being thus changed, and two globular red swellings being prominent.

FIG. 2.—Chronic Laryngitis. The hyperæmia is here less intense and more diffuse, but still very distinct. The left vocal cord is most affected.

### PLATE II.

FIG. 1.—Here a large fleshy-looking growth is seen to occupy the anterior half of the glottis. It was intimately connected with the right vocal cord. I removed the growth, and the patient completely recovered, the voice having been quite restored.

FIG. 2.—Wide-open Glottis, showing the Rings of the Trachea and the Bifurcation of the Bronchi. The form of

the larynx is normal, but there is deficiency of colour. This anæmia contrasts strongly with the hyperæmia of Plate I. This patient became consumptive. Anæmia of the larynx should be regarded as a suspicious symptom.

### PLATE III.

FIG. 1.—Enormous Swelling of the Arytænoids. The right is the most swollen, but the left is more congested. Swelling of this kind is more frequently met with in consumption, and has sometimes been spoken of as pathognomonic of phthisis. It may, however, arise from other causes. In consumption it is usually paler than in this case.

FIG. 2.—Consumption. The epiglottis is ulcerated at the edge, and has the appearance of a saw or of being worm-eaten. The swollen condition of the arytænoids is also seen, and they are less congested than in the previous Figure. There is also an ulcer on the left cord. This was healed, and the case is a most satisfactory instance of arrested consumption. It is so often stated that such cases are hopeless that it is a delightful duty to depict this and report the recovery.

### PLATE IV.

Rhinoscopic Image. In the chapter on Rhinoscopy, pp. 84 to 102, I have fully described the appearance of the parts in health. Here I hope to diminish the difficulties of the beginner by a picture of what he is to look for. The two sides of the image are drawn at a distance from each other. On one I have had the names of the most prominent parts engraved, so as to be a key to the other. The two halves of this plate should be carefully compared with each other, and afterwards with



PLATE 3.



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2

*[Illegible text]*

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# PLATE 4

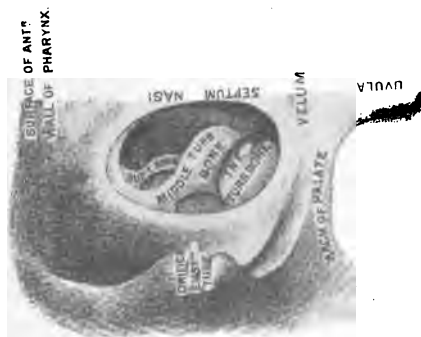








PLATE 5





## PLATE V.,

Which represents the complete Rhinoscopic Image in health, showing the natural colour of the several parts.

The favourable opinions expressed by the most competent critics of these two plates in former editions has induced me, with a view of rendering them still more useful, to have them re-engraved, in order to introduce improvements.













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